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THE
TELEGRAPHIC JOURNAL
AND
ELECTRICAL REVIEW.

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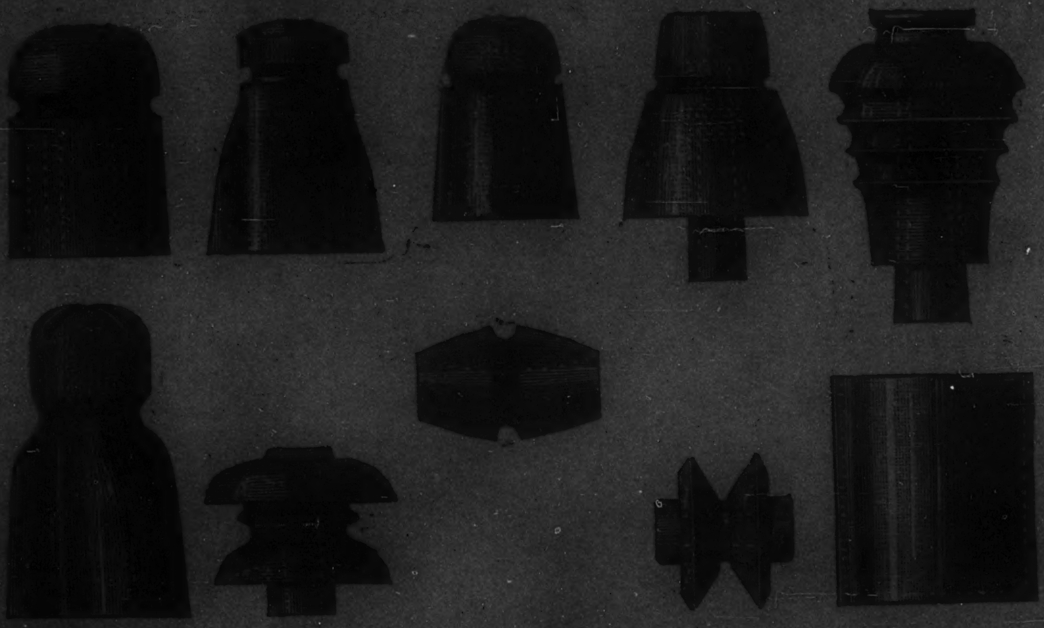

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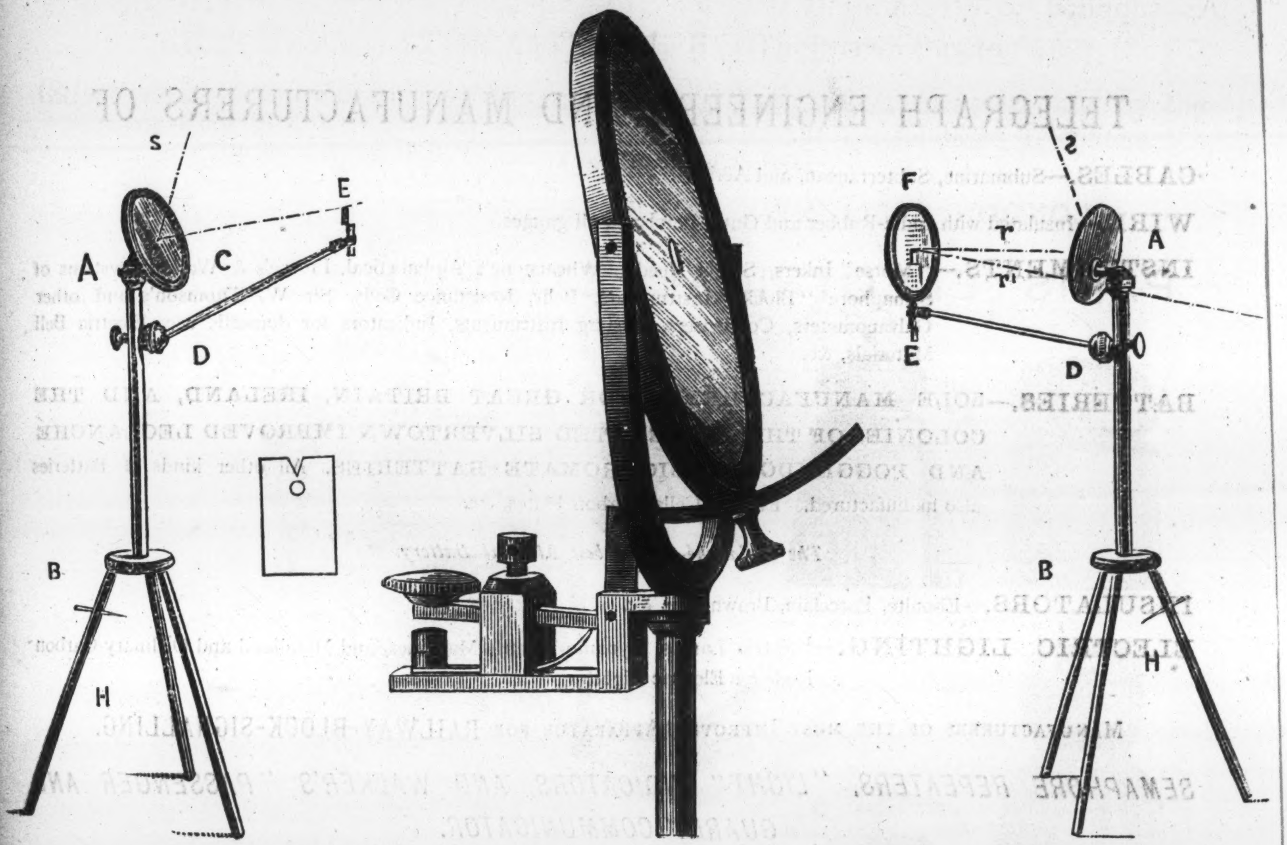

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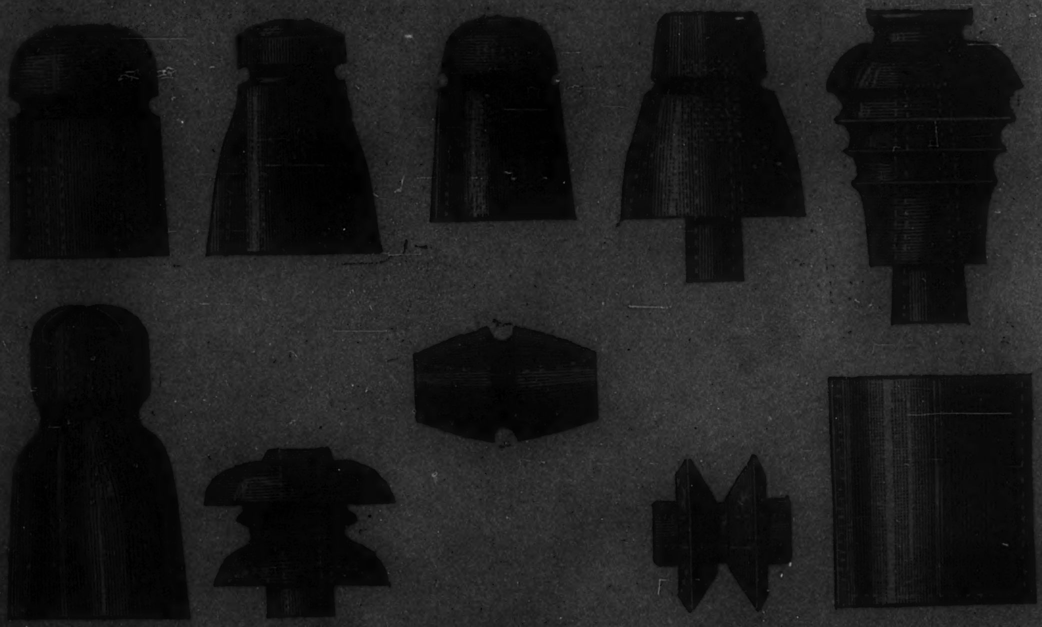

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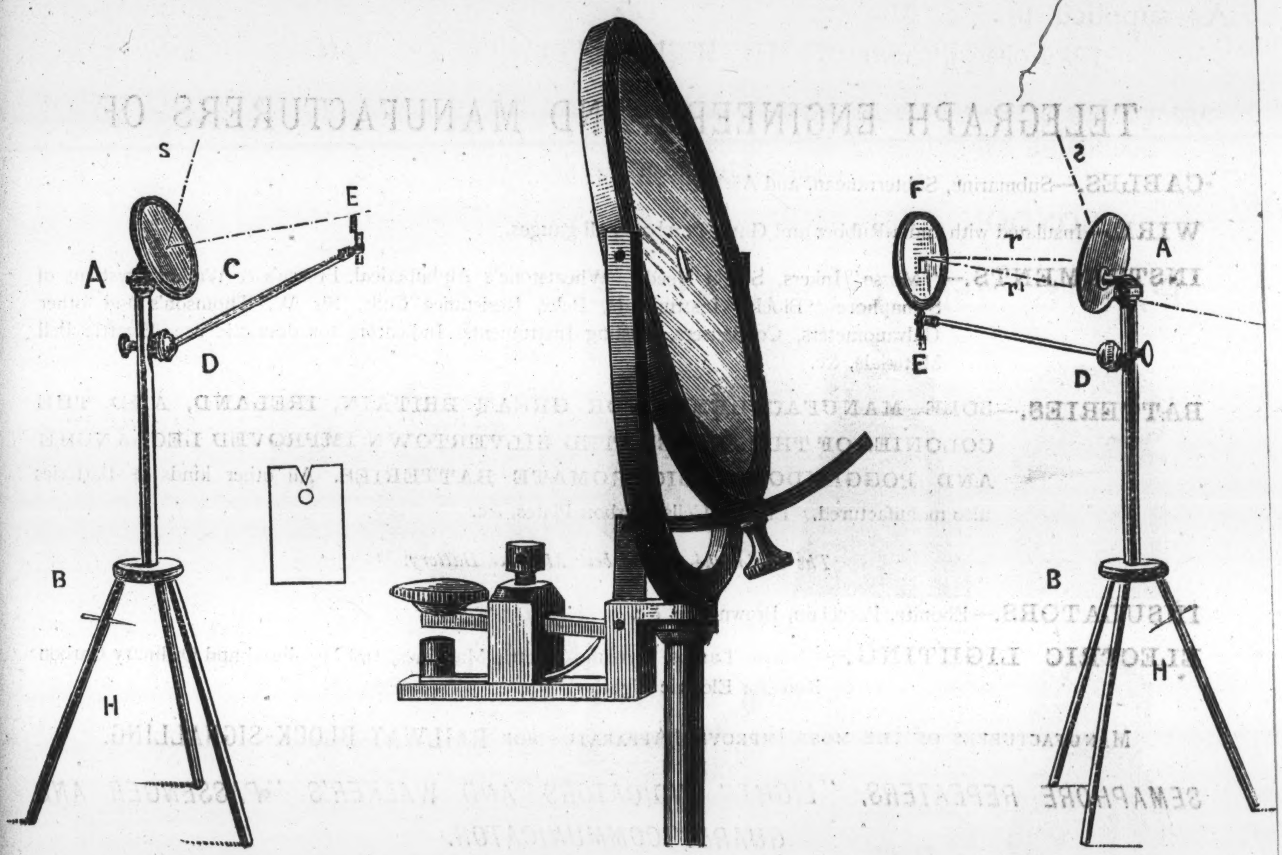

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Telegraph and Electrical Engineer,
76, LITTLE BRITAIN,
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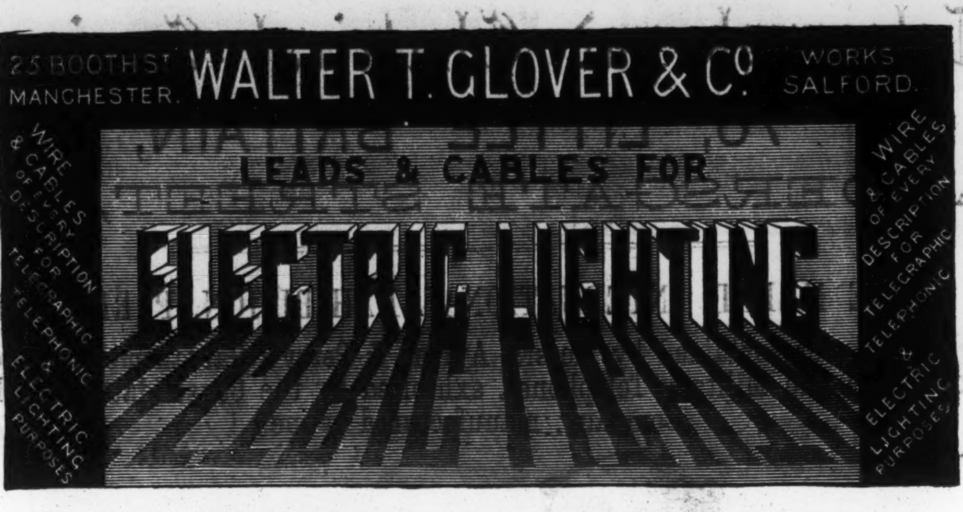

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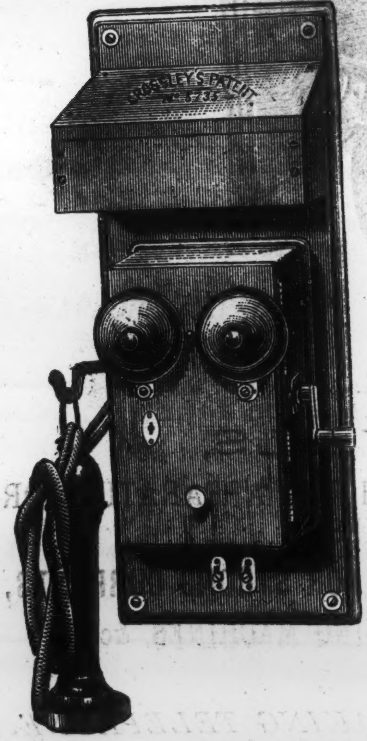

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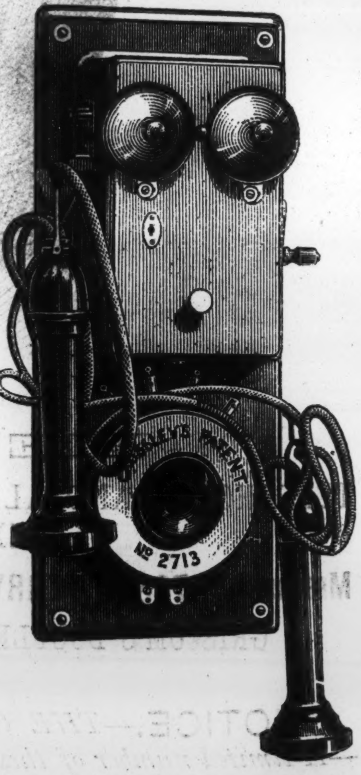
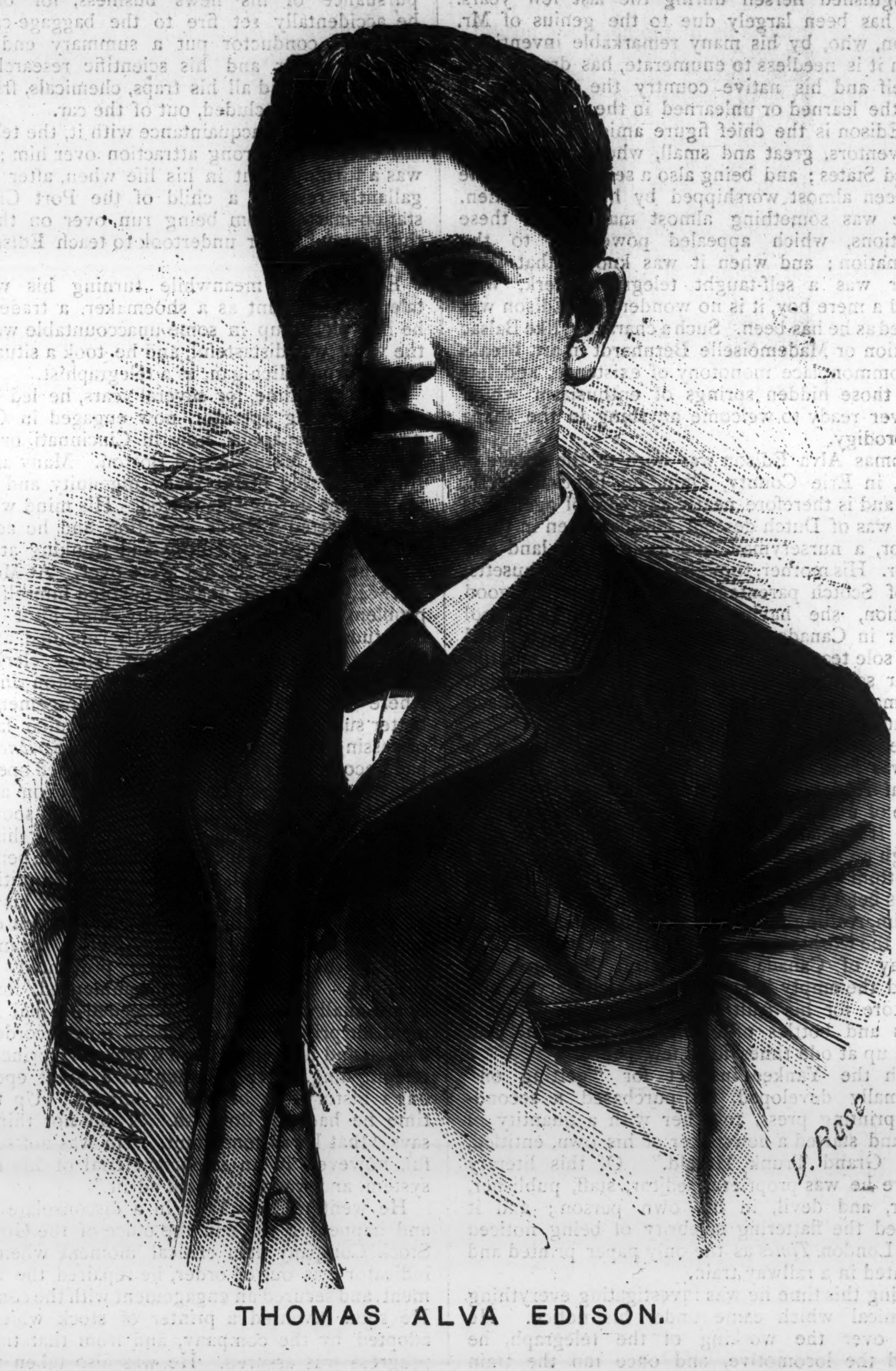


The Crossley Telephone Company supply apparatus for Telephone Exchanges, &c., for Foreign and Colonial use, the United Telephone Company of London having purchased the patent for the United Kingdom.

APPLICATIONS FOR PRICE LISTS, &c., TO BE MADE TO PARIS.

THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.
VOL. IX.—No. 211.



THOMAS ALVA EDISON.

THOMAS ALVA EDISON.

America has long been renowned as the land of mechanical invention; but she has conspicuously distinguished herself during the last few years. This has been largely due to the genius of Mr. Edison, who, by his many remarkable inventions, which it is needless to enumerate, has drawn upon himself and his native country the attention of both the learned or unlearned in the whole world. Mr. Edison is the chief figure amid a perfect host of inventors, great and small, who swarm in the United States; and being also a self-made man, he has been almost worshipped by his countrymen. There was something almost magical in these inventions, which appealed powerfully to the imagination; and when it was known that their author was a self-taught telegraph clerk, who looked a mere boy, it is no wonder that Edison was lionised as he has been. Such a character, like Balsac in fiction or Mademoiselle Bernhardt in art, breaks the commonplace monotony of existence, and lets loose those hidden springs of enthusiasm which are ever ready to welcome anything in the shape of a prodigy.

Thomas Alva Edison was born at the village of Milan, in Erie County, Ohio, on February 11th, 1847, and is therefore nearly 35 years of age. His father was of Dutch descent, and had been in turns a tailor, a nurseryman, and a dealer in land and lumber. His mother, though born in Massachusetts, was of Scotch parentage and a woman of good education, she having formerly been a school teacher in Canada. Indeed, she may be regarded as the sole teacher of her boy, for the two months' regular schooling he received is of no account. Like many other famous men, therefore, Edison was much indebted to his mother.

Like many other famous men, too, Edison, as a boy, was fond of amusing himself alone. He was a great reader, and did not complain about the nature of a book, so long as it was a book of some kind. It is related that he once set himself to read through an entire subscription library, beginning at the bottom shelf, and that he had penetrated several shelves before his project was given up. At ten we find him reading books of chemistry, and when he began the world as a train-boy on the Grand Trunk Railway of Canada and Central Michigan, he littered the empty baggage car, which served him as a store for his fruit and newspapers, with old retorts and bottles of chemicals, which he had picked up at odd times for a few pence.

With the Yankee instinct for "getting on" abnormally developed, he purchased a second-hand printing press, together with a quantity of type, and started a newspaper of his own, entitled, "The Grand Trunk Herald." Of this literary venture he was proprietor, editor, staff, publisher, printer, and devil, in his own person; and it obtained the flattering celebrity of being noticed in the London *Times* as the only paper printed and circulated in a railway train.

During this time he was investigating everything mechanical which came under his notice. He pored over the working of the telegraph, he studied the locomotive, and once ran the train between two stations himself. He also continued his reading, and "Newton's Principia," side by side with "Ure's Dictionary of the Sciences," and "Burton's Anatomy of Melancholy," could have been seen on the news-boy's shelf. He also took to chemical experiments in an evil day for the pursuance of his news business, for one day he accidentally set fire to the baggage-car, and the irate conductor put a summary end to his literary career and his scientific researches, by ejecting him and all his traps, chemicals, fruit, and printing press included, out of the car.

From his first acquaintance with it, the telegraph has exercised a strong attraction over him; and it was a turning-point in his life when, after he had gallantly rescued a child of the Port Clements station-master from being run over on the line, the grateful father undertook to teach Edison how to telegraph.

Edison was meanwhile turning his versatile talents to account as a shoemaker, a trade which he had picked up in some unaccountable way; but the work was distasteful, and he took a situation at Port Huron, Michigan, as a telegraphist.

From this time, for several years, he led the life of a travelling operator, now engaged in Canada, now in Indianapolis, now in Cincinnati, or Louisville, now in Memphis and Boston. Many amusing stories are told of his ready ingenuity and gawky appearance during this period. His mind was now fairly directed towards invention, and he acquired the habit of experimenting and thinking at night, after the duties of the day were over. At Memphis in 1864, we are told, that he devoted himself to the problem of duplex telegraphy, and, after having his studies and ideas frequently ridiculed and discountenanced by his ignorant fellow clerks and masters, he found his way to Boston in 1868, where he met with more encouragement and better success. "In spite of his peculiar fashions of passing his time," says a writer in *Scribner*, "he had become one of the most accomplished operators. He overcame obstacles put in his way on account of a somewhat uncouth appearance, and soon took an important position. He had up to this time dallied with a number of ideas he has since perfected, acquired a beautiful, small, rapid handwriting, as clear as print, and gratified considerably his desire of seeing the world. He had once been on the point of sailing for South America, from New Orleans, but had only been prevented by an accident. A new period commenced for him. Some small things of his succeeded—a dial instrument for private use, a chemical note-recorder, and others, and he began upon a vibratory principle of telegraphing. He commenced a great epoch in one's history—to believe in himself. Up to this time he had not done so. 'I did not think,' he says, 'that I was competent.' He was not successful, however, in an important trial of his duplex system, and was soon again adrift."

He went to New York in a disconsolate mood, and happening to be in the office of the Gold and Stock Company at a critical moment when their indicator was out of order, he repaired the instrument, and secured an engagement with the company. He soon invented a printer of stock which was adopted by the company, and from that time his progress was assured. He was also taken up by the Western Union Telegraph Company, and retained by both companies at a handsome salary, to give them the first bid for his new inventions. He was now in a position to start a manufactory of his own at Newark, New Jersey, where he made all his gold and stock printers, and employed about 300 men; but the business left him too little leisure for invention, so he sold out and retired to Menlo Park, a new settlement of a few yellow-painted wooden houses on the Pennsylvania Railway in New Jersey, about 20 miles from New York. Here he built a large barn-like structure upon the top of a hillock, and fitted it out as a workshop and laboratory, the workshop being on the basement and the laboratory upstairs. The former is well supplied with tools, lathes, and workmen, who are kept busy making patterns and transforming the inventor's ideas into wood and iron; while the latter is stocked with books, experimental apparatus, and so many chemicals besides that it looks like a wholesale drug-store. He is said to buy a quantity of every new drug which appears in the market, for he does not know how soon he may want it in his experiments; but we suspect that he has a passion for surrounding himself with chemical compounds, just as a bibliophile has a passion for surrounding himself with books. In this laboratory, Edison has everything at his command; he is provided with several skilful assistants selected by himself for their zeal and ability, who are ready to test all his suggestions, and also to offer ideas of their own. He has workmen to make all the instruments and models he may require, and what is more he can give all his time and thought to the work he has in hand. Menlo Park is an inventors' paradise not to be found in any other country; and though this fact tends to lessen our surprise that Edison should have accomplished so much, we ought not to forget that it was his own genius and industry which first created the place. We need not dwell at length on his several inventions, for they have been so frequently cited and published of late, that they are familiar to most electricians. Before the invention of the loud-speaking telephone and the phonograph had enormously extended his fame, Edison was becoming known on this side of the Atlantic as a rising young genius, sure to do wonders in his day, and his gold and stock printer, his electric pen, electro-motograph, and quadruplex system, had given him a solid reputation as an electrical inventor. Then came the invention of the carbon telephone, the phonograph, and microtasimeter, which swelled his fame to world-wide bounds, and finally, as if to inflate it to bursting point, he telegraphed the enthusiastic but rash announcement across the Atlantic in October, 1878, that he had solved the problem of the divisibility of the electric light, and would soon be able to light up our homes by electricity, at a mere fraction of the cost of gas. A year or two has since passed by, and although the letter of the announcement cannot yet be said to have been fulfilled, yet, by dint of ceaseless energy, Edison has gone far towards accomplishing what he anticipated. The exhibit at the Paris Electrical Exhibition shows that he has overcome some of the obstacles in his way, and that he has attained a large measure of success. The invention of the phonograph is undoubtedly one of the most transcendent flashes of mechanical inspiration that ever entered into the mind of a man; and the loud-speaking telephone, with its carbon transmitter and prepared chalk receiver, is one of the greatest marvels ever constructed out of dead matter. On hearing it and examining it, we cannot but wonder at the daring hardihood and patience of invention which has made it what it is.

Edison has taken out in all about three hundred patents. He has been called "the young man who keeps the road to the Patent Office hot with his footsteps." His plan appears to be to patent all the ideas that occur to him, whether tried or untried, and to trust to future labours to select and combine those which prove themselves the fittest. The result is that the great bulk of his patents are valueless in point of practicability; but they serve to fence the ground in from other inventors.

From our illustration, it will be seen that Edison's appearance is youthful in the extreme. "When you go to his house," says a writer, "he may very possibly answer your inquiry for 'Mr. Edison' himself; or, if not, you will be shown into his laboratory, where you will find him among his assistants; and if you try to guess which is Mr. Edison, your best plan will be to select the least obtrusive person in the group. His figure is slight and young-looking, though the face, from its long habit of concentration, has an old look; he has a frank, cordial expression, and, like most men of great powers, can be almost a boy when his attention is turned away from his absorbing interests. But when he is not aroused, he seems to retire within himself, as if his mind had travelled a long way off, and his attention comes back slowly. He has the peculiar pallor of a night worker, and if you stay with him through the night, you will find him as bright at the end of the vigil as at the beginning." His power of work is something extraordinary, it being usual for him to work sixteen hours each day, and at a stretch; as, for example, when he invented the phonograph, he has eschewed sleep for days and nights on end. More than one assistant has already succumbed to the strain of trying to keep up with him.

Mr. Edison is married, and has three children, two boys and a girl, one of each sex being nicknamed respectively Dot and Dash. He is young, and as he comes of a long-lived stock, notwithstanding the severe strain to which he subjects his powers, we may reasonably expect that he will continue to bestow many useful inventions on his age. We can assure him that should he ever fulfil his intention of coming to England, he will meet with a cordial reception from English electricians.

* * *

The Crystal Palace Electrical Exhibition.—The Postmaster-General has arranged with the Crystal Palace Company to exhibit the whole of the instruments now exhibiting at the Paris Exhibition by the British Postal Telegraph Department. In addition, there will probably be shown in actual use several of the best fast-speed instruments employed by the department.

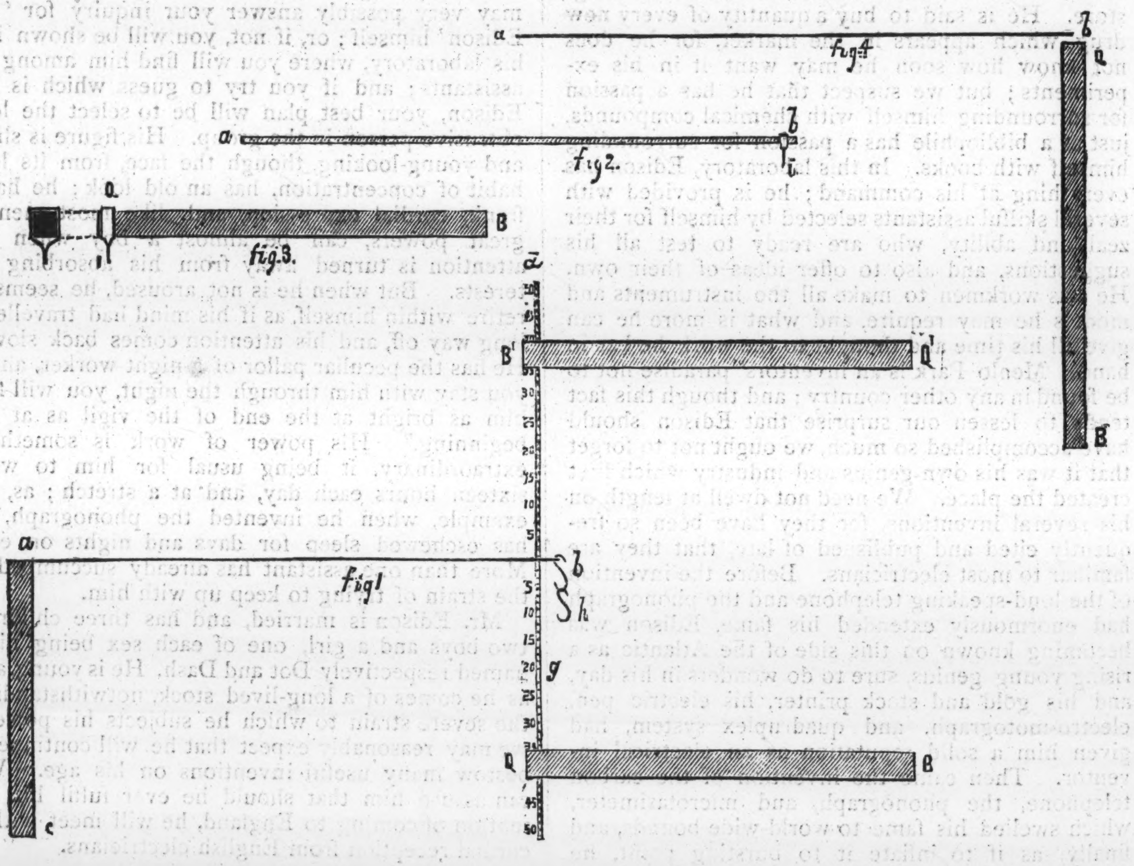
The Electric Light.—The Duke of Sutherland has decided upon lighting his residence at Trentham with the electric light supplied by the British Electric Light Company.

THE PARIS ELECTRICAL EXHIBITION.

FOREIGN SECTIONS.

DR. ANTONIO COSTA SAYA, PROFESSOR OF PHYSICS IN THE UNIVERSITY OF MESSINA.

"MAGNETIC DYNAMOMETER."—The principal part of this instrument consists of two magnets, *a b*, Q B, and a scale, *d g* (fig. 1), arranged upon a rectangular base of wood. The two magnets are placed one above another in such a manner that the axes of symmetry are horizontal and in the same vertical plane. Each of these two magnets carries a very slender index, *i* (fig. 2), I (fig. 3), placed at right angles with the axis of symmetry and in the medium horizontal plane of its thickness.



The first magnet, *a b* (fig. 1), is formed of a long, narrow and thin spring of steel, which is fixed horizontally at one end, *a*, to a perpendicular support, *a c*, and left free at the other extremity, *b*; the latter carries the index, *i*, which by bending *a b* slides along the scale, *d g*; this scale is finely divided into equal graduations, and can be raised or lowered. In order to secure the scale in its exact position before experimenting, the second magnet, Q B, is removed from its support and the scale fixed by means of a set-screw, so that its zero corresponds precisely to the index, *i*, of the spring, *a b*. The plane upon which the magnetic dynamometer is placed during experimentation ought to be very firm and it should not be affected by the oscillations of the floor.

The second magnet, Q B, is placed upon a movable toothed support, by means of which it can be aproximated to the other magnet, *a b*, or removed from it. Upon the button of the rack-work is a set-screw to fix the support of the magnet, Q B, at the desired height.

In such an instrument the magnetic attraction or repulsion is counterbalanced by the elasticity of flection. The following experiments will exemplify the method of working the apparatus.

First Experiment.

The magnet, Q B, is removed from its support, and removed so far from the instrument that it cannot act upon the spring-magnet, *a b*; then it can be demonstrated that the inflection of *a b* is proportional to the force which produces it. At *b* there is suspended a very slender copper wire of the form of S for the purpose of lowering the index, *i*, a short distance, *l*, from the scale, *d g*; to the weight there is appended a second one, *h*, of equal weight, so that the index can be lowered to, 2 *l*, and by means of other weights this lowering can be extended to any degree sufficient for the use for which the instrument is intended. If the chain of weights, *b h*, be removed the index will return to the zero of the scale, *d g*. This experiment shows that within certain limits the inflections of the spring, *a b*, are proportional to the force which produces them.

Second Experiment.

The magnet, Q B, is placed upon its support in a direction parallel to *a b*, as is indicated in fig. 1, and in such a manner that its magnetic pole, Q, corresponds to the contrary magnetic pole, *b*, of the spring-magnet, *a b*; moreover it is placed near the scale, *d g*, before which extends the index, I, fixed to a ring. This arrangement enables the index, I, to be placed at a convenient distance from the scale upon which are marked the different heights at which the magnet, Q B, is placed on raising or lowering it.

This being done and the magnet, Q B, being always kept in a parallel position, it is brought to a certain distance from the spring, *a b*, in such a manner as to cause a lowering of the index, *i*; and preserving this, the magnet, Q B, is moved slowly backwards and forwards to find the position which corresponds to the maximum depression of the index, *i*; in such movements the axis of the magnet, Q B, ought not to change its distance from the other magnet, *a b*, nor be removed laterally. When such a position of the magnet, Q B, is found, it is fixed with a set-screw and then the magnetic dynamometer is ready for experiments, by means of which it is demonstrated that magnetic attraction varies inversely as the square of the distance.

Third Experiment.

The magnet, Q B, is removed from the magnet, *a b*, until its index, *i*, marks a slight depression, *l*, and then the corresponding distance, *d*, of the two poles, *a*, *b* (measured from the distance of the two indices, *i*, I), is noted.

This being done the magnet, Q B, is approached to *a b*, it being always kept in the same parallel position so as to reduce to $\frac{1}{2}$ *d* the distance of the two poles, *a b*; it will then be seen that there is a depression of the index, *i*, quadruple that formerly obtained, on 4 *l*. Thus it is shown that the magnetic attraction between the two poles, Q and *b*, varies in the inverse ratio of the squares of their distances. On reducing then the distances of the two poles to $\frac{1}{3}$ *d*, the depression of the index will be 9 *l*, or ninefold the first, as it ought to be according to the law in question.

In making such experiments it is necessary to avoid a too close proximity of the magnets, and the first depression, *l*, must be very small.

If it is desired to make a large number of experiments in confirmation of the said law, the following method may be employed.

Fourth Experiment.

Let l, l^1, be equal depressions of the index, *i*; and d d^1, the relative distances of the two poles, Q and *b*, then in accordance with the known law

$$(1) \qquad l, d^2 = l^1, d^{12}$$

$$\text{whence } (2) \qquad d^1 = d\sqrt{\frac{l}{l^1}}$$

Let us suppose that at the known distance, *d*, there is a known depression, $l = 0·2$ of the scale by the index, *i*, then (2) we have

$$(3) \qquad d^1 = d\sqrt{\frac{0·2}{l^1}}$$

If we wish to know the distances, d', d'', d''', &c., of the two poles, *a* and *b*, corresponding to the depressions, $l' = 0·4$; $l'' = 0·6$; l''' 0·8, &c., it is sufficient to substitute for l', in the equation (3) the numerical values of the distances, d', d'', d''', and approximating successively the pole, Q, to the pole, *b*, there are obtained the depressions corresponding to the index, *i*, in conformity with the law above mentioned.

Magnetic Repulsion.

To prove the same law for magnetic repulsion, the magnet, Q B, is placed above *a b*, in the position B′ Q′ (fig. 1), parallel to *a b*, so that the two homonymous poles, *b* and B, of the two magnets may correspond in the same perpendicular. To the latter is adapted the ring which carries the index, I, laying hold of the pole, Q, which in this new position will correspond to Q′.

By this arrangement of the two magnets, the index, *i*, of the magnet, *a b*, will be depressed by the magnetic repulsion between the two similar poles, B′ and *b*. The experiments may be made in the same manner which was employed for demonstrating the law of magnetic attraction.

Distribution of Magnetism in a Magnet.

The instrument in question is useful for studying the distribution of magnetism in a magnet, Q B. For this purpose it is not placed in a parallel position, but in such a manner that the axes of symmetry of the two magnets, *a*, *b*, Q B (fig. 4), may be situated horizontally at different heights, and in two planes, vertical and perpendicular. This position of the magnet, Q B, is called the perpendicular position, to distinguish it better from the parallel position.

Let Q B be placed in the perpendicular position under *a b* (fig. 4) so that the two contrary poles, *b*, *q*, may correspond in the same vertical, and at such a distance as to have a depression of the index, *i*, equal to 9 *l*. This being done, the needle, Q B, is moved very slowly, so that its different sections may correspond successively in the same vertical of the pole, *b*; the index, *i*, will be raised till it returns to zero, and if the movement of Q B is then continued, the index will be pushed in the opposite direction, passing above zero, and rising till the homonymous pole, B, of the magnet, Q B, will be placed below *b*.

A T-shaped support assists in maintaining the magnet, Q B, in the perpendicular position, so that the above-mentioned experiment can be made convenient.

In this and other experiments, it is useful for the magnet, Q B, to be adapted to a scale for better determining the corresponding section, in the same vertical plane, which passes through *b*, when the index, *i*, marks a positive or a negative deviation or none.

Magnetic Actions through Bodies.

It is easy to demonstrate with this instrument that magnetic action is propagated without becoming weakened through many bodies. It is sufficient to interpose the bodies, holding them in the hand, between the poles of the two magnets placed in the parallel position (fig. 1) so as to have a certain depression of the index, *i*. The index will then be seen to remain motionless on interposing between the two poles copper, glass, wood, &c., and to

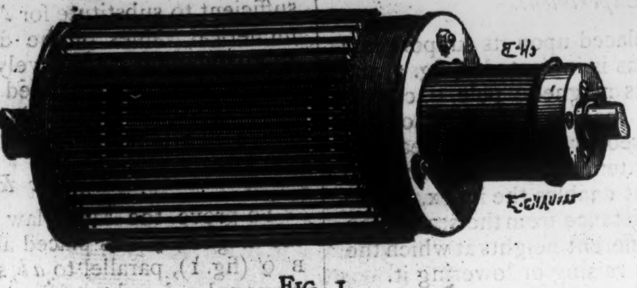


FIG. 1.

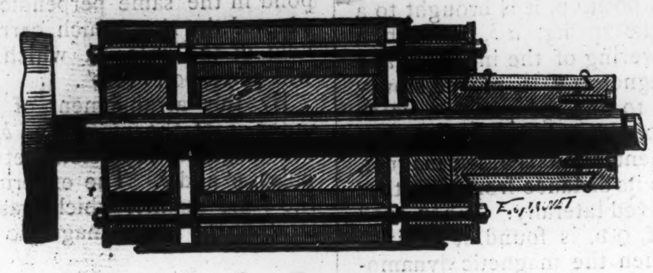


FIG. 2.

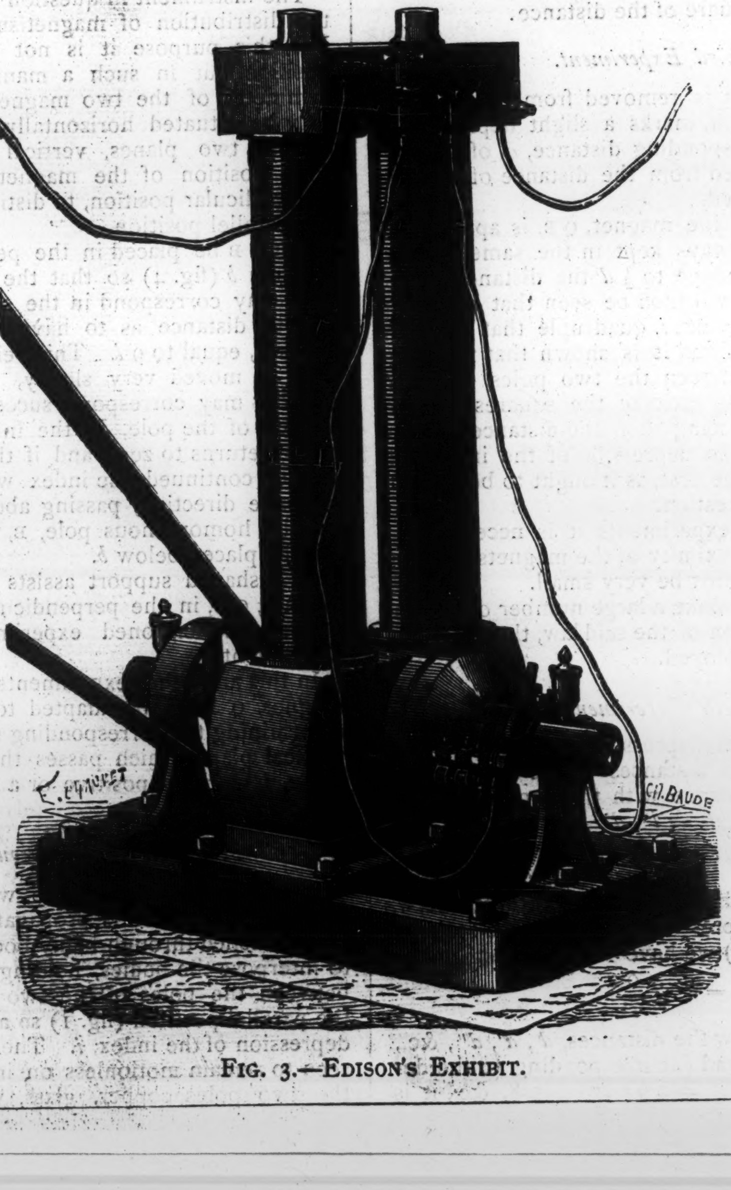


FIG. 3.—EDISON'S EXHIBIT.

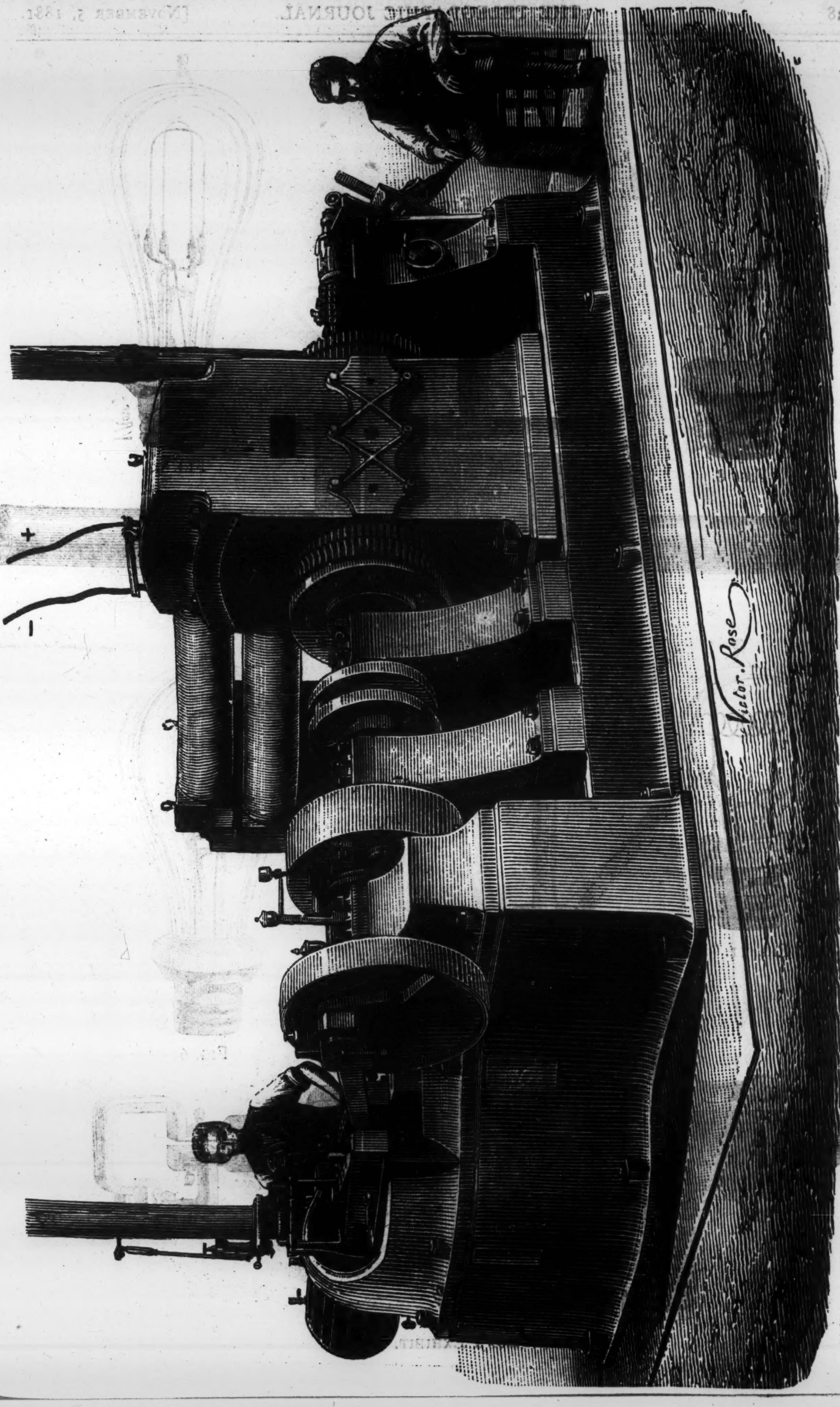


FIG. 3A.—EDISON'S EXHIBIT.

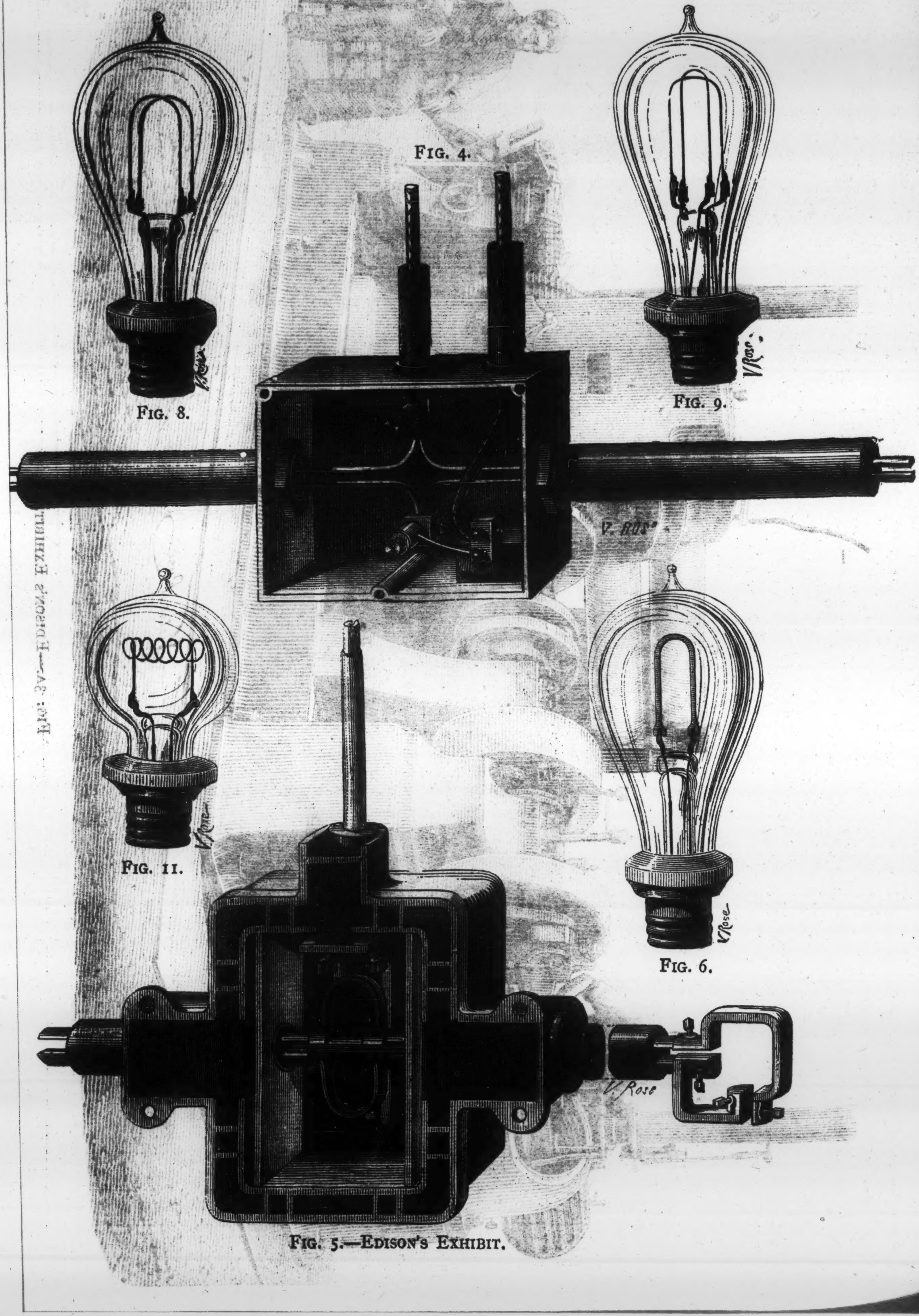


FIG. 8.

FIG. 9.

FIG. 4.

FIG. 11.

FIG. 6.

FIG. 5.—EDISON'S EXHIBIT.

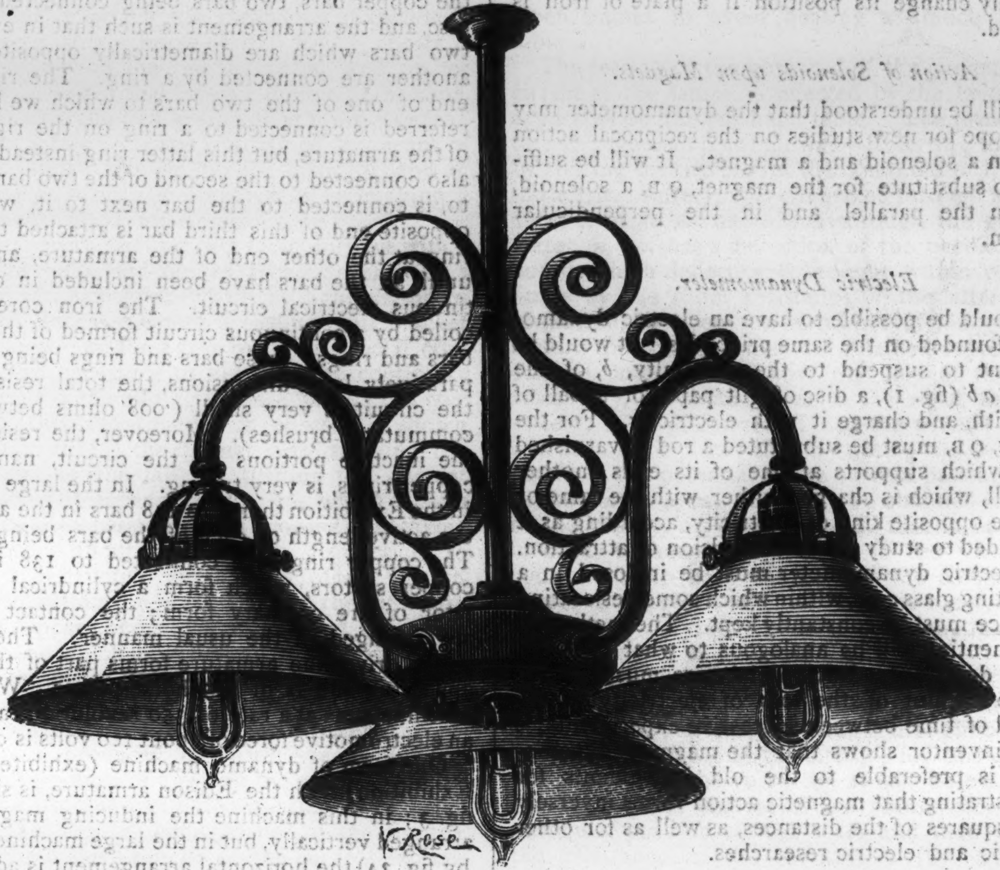


FIG. 13.

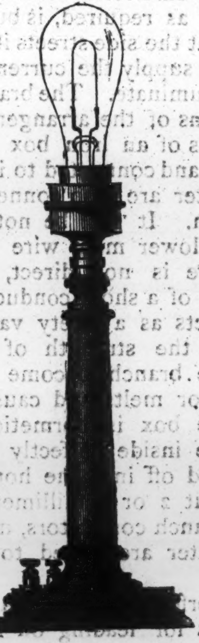


FIG. 7.

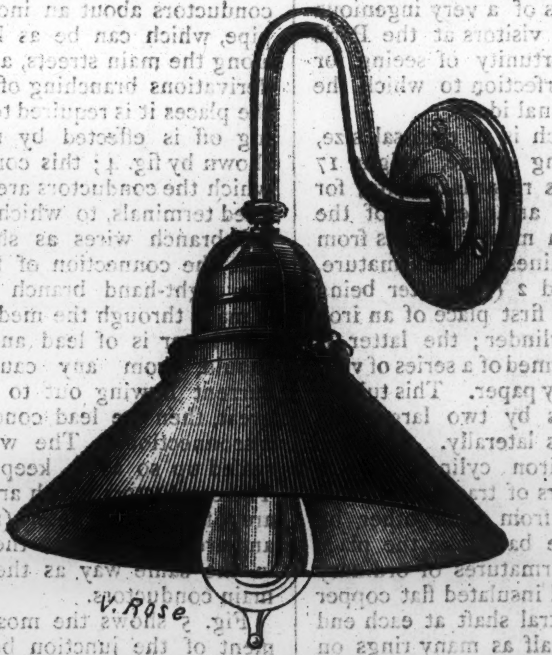


FIG. 12.—EDISON'S EXHIBIT.

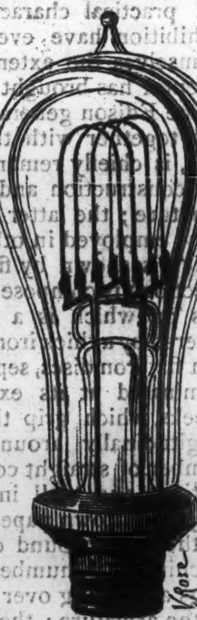


FIG. 10.

suddenly change its position if a plate of iron is inserted.

Action of Solenoids upon Magnets.

It will be understood that the dynamometer may give scope for new studies on the reciprocal action between a solenoid and a magnet. It will be sufficient to substitute for the magnet, Q B, a solenoid, both in the parallel and in the perpendicular position.

Electric Dynamometer.

It would be possible to have an electric dynamometer founded on the same principles. It would be sufficient to suspend to the extremity, *b*, of the spring, *a b* (fig. 1), a disc of gilt paper or a ball of elder pith, and charge it with electricity. For the magnet, Q B, must be substituted a rod of varnished glass, which supports at one of its ends another pith ball, which is charged either with the same or with the opposite kind of electricity, according as it is intended to study electric repulsion or attraction. The electric dynamometer must be inclosed in a well-fitting glass case, within which some desiccating substance must be constantly kept. The method of experimenting will be analogous to what has been already described. But special care must be had to take account of the loss of electricity in the interval of time between successive experiments.

The inventor shows that the magnetic dynamometer is preferable to the old instruments for demonstrating that magnetic action varies inversely as the squares of the distances, as well as for other magnetic and electric researches.

EDISON.

"ELECTRIC LIGHT APPARATUS."—The whole system of electric lighting by incandescence, as worked out by Mr. Edison, is of a very ingenious and practical character, and visitors at the Paris Exhibition have every opportunity of seeing for themselves the extent of perfection to which the inventor has brought his original ideas.

The Edison generator, which is of colossal size, and, together with the driving engine, weighs 17 tons, is chiefly remarkable, as regards novelty, for the construction and general arrangement of the armature; the latter differs in many respects from those employed in other machines. This armature, which is shown by figs. 1 and 2 (the latter being a section) is composed in the first place of an iron axis on which is a wood cylinder; the latter is covered by a thick iron tube formed of a series of very thin flat iron discs, separated by paper. This tube is terminated at its extremities by two large iron cheeks, which grip the plates laterally. Arranged longitudinally around the iron cylinder are a number of straight copper bars of trapezoidal cross section, and well insulated from each other by prepared brown paper; these bars take the place of the wire wound on the armatures of ordinary machines. A number of well insulated flat copper rings are strung over the central shaft at each end of the armature; there are half as many rings on either side as there are bars, that is to say, if, for example, there were 50 bars, then there would be 25 rings on either side of the armature. The left-hand rings are connected to the left-hand ends of the copper bars, two bars being connected to each disc, and the arrangement is such that in every case two bars which are diametrically opposite to one another are connected by a ring. The right-hand end of one of the two bars to which we have just referred is connected to a ring on the right hand of the armature, but this latter ring instead of being also connected to the second of the two bars alluded to, is connected to the bar next to it, whilst the opposite end of this third bar is attached to a fresh ring at the other end of the armature, and so on until all the bars have been included in one continuous electrical circuit. The iron core is thus coiled by a continuous circuit formed of the copper bars and rings; these bars and rings being of comparatively large dimensions, the total resistance of the circuit is very small (·008 ohms between the commutator brushes). Moreover, the resistance of the inactive portions of the circuit, namely the copper rings, is very trifling. In the large machine in the Exhibition there are 138 bars in the armature, the active length of each of the bars being 3½ feet. The copper rings are connected to 138 insulated copper sectors, which form a cylindrical commutator of the ordinary form; the contact brushes are arranged in the usual manner. The engine which drives the armature forms part of the whole apparatus and is of 125 horse-power. When the machine runs at a rate of 350 revolutions a minute an electromotive force of about 100 volts is obtained.

One form of dynamo machine (exhibited at the Exhibition) with the Edison armature, is shown by fig. 3; in this machine the inducing magnets are arranged vertically, but in the large machine (shown by fig. 3A) the horizontal arrangement is adopted.

The conductor for conveying the current in the Edison system consists of a metal tube about 3 inches in diameter, containing a cheap insulating substance, and traversed by two half-round copper conductors about an inch in diameter. This main pipe, which can be as long as required, is buried along the main streets, and at the side streets it has derivations branching off, to supply the current to the places it is required to illuminate. The branching off is effected by means of the arrangement shown by fig. 4; this consists of an iron box into which the conductors are led and connected to insulated terminals, to which latter are also connected the branch wires as shown. It will be noticed that the connection of the lower main wire with the right-hand branch wire is not direct, but is made through the medium of a short conductor; this latter is of lead and acts as a safety valve; should, from any cause, the strength of the current flowing out to the branch become too great, then the lead conductor melts and causes a disconnection. The whole box is hermetically sealed up so as to keep the inside perfectly dry. The conductors which are led off into the houses, are of small diameter (about 2 or 3 millimetres) and are joined on to the branch conductors, much in the same way as the latter are joined to the main conductors.

Fig. 5 shows the most perfect form of arrangement of the junction boxes for leading off from the main conductors; the general principle, it will be seen, is similar to that indicated by fig. 4.

The forms, &c., of the Edison incandescent lamps are very numerous. Figs. 6 and 7 show the simplest arrangement, in which the incandescent carbon is formed by a single horse-shoe. Fig. 8 shows a double horse-shoe, the two being coupled up for "quantity." Fig. 9 also shows a double horse-shoe, but in this case the two are coupled up in "series." In fig. 10 a large surface is obtained by means of four horse-shoes coupled up for quantity, and in fig. 11 a large surface is obtained by employing a long filament coiled into a spiral.

Fig. 12 shows a wall bracket lamp, formed with a single glass bulb, and fig. 13 a chandelier with 3 lamps. A large chandelier with 80 lights is shown by fig. 14. In cases where a folding wall bracket lamp, as shown by fig. 15, is required, special contrivances are necessary to keep up the continuity of the circuit at the folding joints, A and B; the way in which this requirement is effected is shown by figs. 16 and 17, the former also showing the arrangement of the tap for turning the current on and off. Referring to fig. 16, which shows the tap, the object aimed at was a means of breaking the current without causing the disjunction to produce a destructive spark; this object was attained by effecting the break through the interposition of a copper cone which terminated the screw of the tap and which moved away from between two thick copper plates which were in the line-circuit; the continuity being thus broken between two points, both of which had large surfaces, the resulting spark produced but little effect. Fig. 18 shows another form of a tap on the same principle; this tap is provided with a lead safety wire (seen towards the top left hand corner of the figure), which melts if the strength of the current exceeds a safe value. Figs. 19 and 20 show a tap for main circuits; in this case there are three cone pieces, which all move together when the tap is turned, so that the continuity of the circuit is broken at six points simultaneously.

For coal-mining purposes, Mr. Edison has designed the lamp shown by fig. 21; in this arrangement the lamp and connections are kept covered with water contained in a glass vessel, so that contact of the gas in the mine with any part of the lamp likely to become broken is impossible.

In cases where it is required to be able to diminish or increase the light given by a lamp, the arrangement shown by figs. 22 and 23 is employed; this consists simply of a number of carbon bars of different sizes, any one of which can be inserted in the circuit by turning a disc piece (shown separately in the lower part of fig. 23), which makes a contact with the carbon giving the necessary resistance. The whole set of bars are covered by a perforated cylinder (shown in fig. 22), which allows the air to circulate and keep the bars cool.

The regulation of the current strength Mr. Edison effects by means of a system of testing. This arrangement is shown by figs. 24 and 25. Referring to fig. 25, it will be seen that the rheostat, *e*, is in circuit with the inducing magnets of the dynamo machine, A; by this means the action of the latter can be regulated at will by introducing in the circuit referred to, more or less resistance according as the current in the circuit of the lamps is observed to be increasing or decreasing from its normal strength. The resistances of the rheostat are seen in fig. 24 underneath the right-hand table. They are made of thick wire, and are wound on open frames to avoid heating as much as possible.

The testing of the potential of the current in the circuit of the lamps is effected by the help of the apparatus on the left-hand table. The principle of this arrangement is as follows:—Referring to fig. 25, by shifting the two bars of the commutator *j*, over to the left, the battery, D, is connected through a resistance, *i*, of 50,000 ohms, and through the galvanometer, *n*, so that a deflection of the needle is produced, which deflection is brought within readable limits by the shunt resistance, *h*, the latter being connected between the terminals of the galvanometer; the steady deflection obtained represents a definite potential. If now the bars of the commutator, *j*, be shifted over to the right, then the battery, D, is disconnected and the wires, *c c*, connected in their place; then by noting the deflection obtained, the potential of the current passing in the conductors, *a a*, can obviously be obtained in terms of the battery, D. In practice all that is necessary in order to keep the potential in the wires, *a a*, constant, is to keep the bars of the commutator, *j*, over to the right, and then to keep the deflection constant by varying, when necessary, the resistance in the rheostat, B.

Instead of keeping the current constant by the galvanometer observation, this can be done by observing the photometric value of the light obtained from a lamp placed in the circuit; for this purpose the photometer shown by fig. 26 can be employed. By placing the chariot of the photometer at any particular position on the scale, and then varying the resistance in the rheostat, E (fig. 25), it is obvious that any required standard of illumination can be kept up in the lamps on the circuit.

We understand that Mr. Edison's English representative has taken the commanding premises at 57, High Holborn, for the purpose of exhibiting the entire Edison apparatus. Every opportunity will be given for thorough tests of the system being made by those interested in the subject.

Giovanni Serravalle.

"Automatic Apparatus for Covering Wires." The great demand for silk or cotton-covered copper wires for electro-magnetic apparatus has led Signor Giovanni Serravalle, mechanician of the Physical Cabinet of the University of Messina, to devise an automatic apparatus which, without any supervision, should maintain perfect uniformity and continuity of action whilst covering the entire length of any wire whatever. The machine is driven by an electric motor, for which a couple of Bunsen elements furnish a sufficient current. The complete apparatus is composed of two parts, viz., the machine which covers the wire and the motor.

The first is represented in section in fig. 1. The axle, B B, is set in motion by means of the wheel, A A, which communicates with the motor by means of an endless band (not shown in the figure). This axle transmits its motion, on the one hand, by means of a series of wheels at *c e*, to two cylinders, *i i'*, which revolve in the direction indicated by the arrows, and on the other hand by means of the wheel, A, to the coverer, E, which is composed of another axle, L L″, parallel to the former and carrying a disc, N N^1, to which are adapted four bobbins full of silk for covering the wire. The wire enters into L, and traverses the interior of the axle, L L″, and is compressed by the two cylinders, *i i′*, which by their movement drive it outward. The silk threads coming from the bobbins after having passed through various little apertures lined with glass, reunite, two from one side and two from the other, on O, which is on the same axle from which they wrap themselves on the metal wire which comes slowly forward.

In order that the cylinder, *i i′*, may take wires of different sizes, the iron ring which holds the upper cylinder is united to the fixed part of the machine. This cylinder can within certain limits be moved away from the lower one, *i*, whilst the spring, *r*, always presses upon it. Whenever this adjustment is not sufficient for wires which are too thick or too slender, the cylinders may be substituted by others.

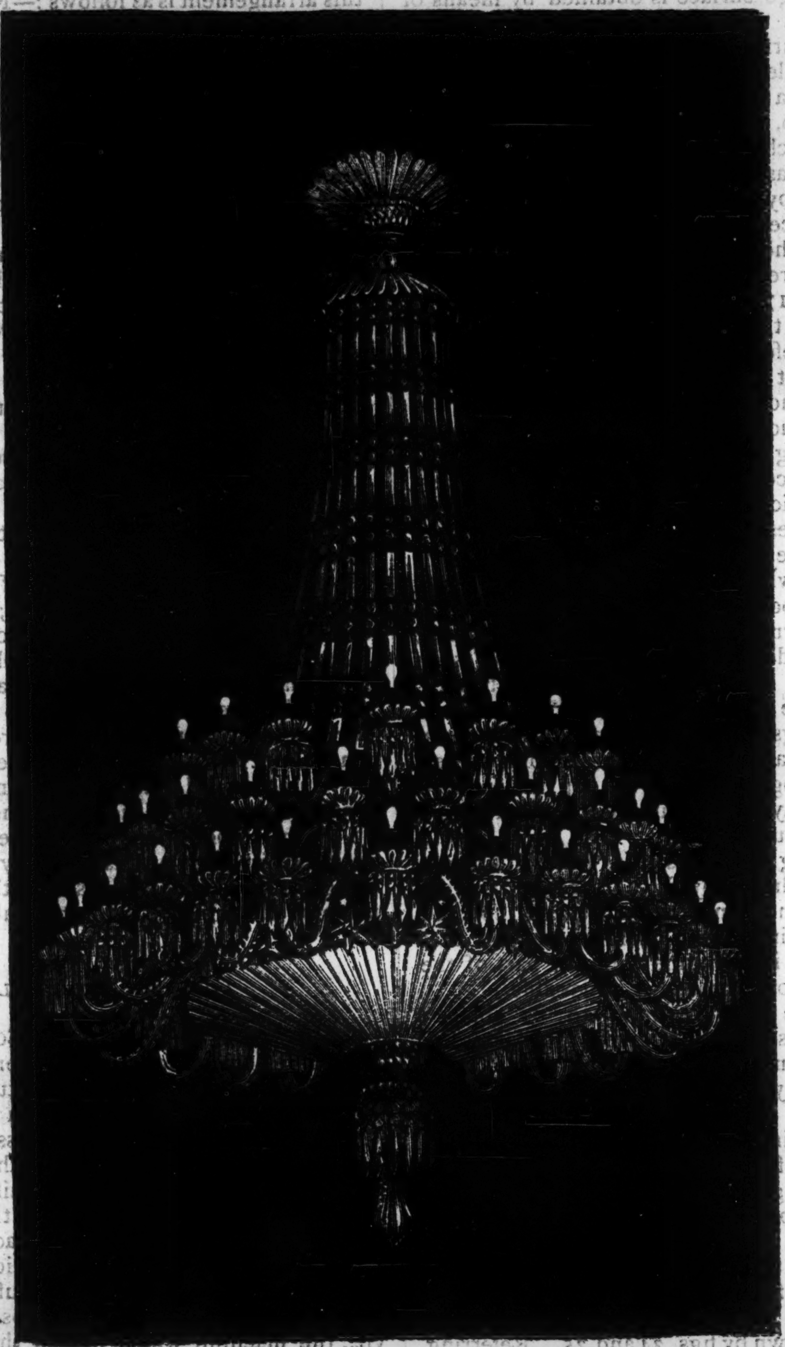


FIG. 14.—EDISON'S EXHIBIT.

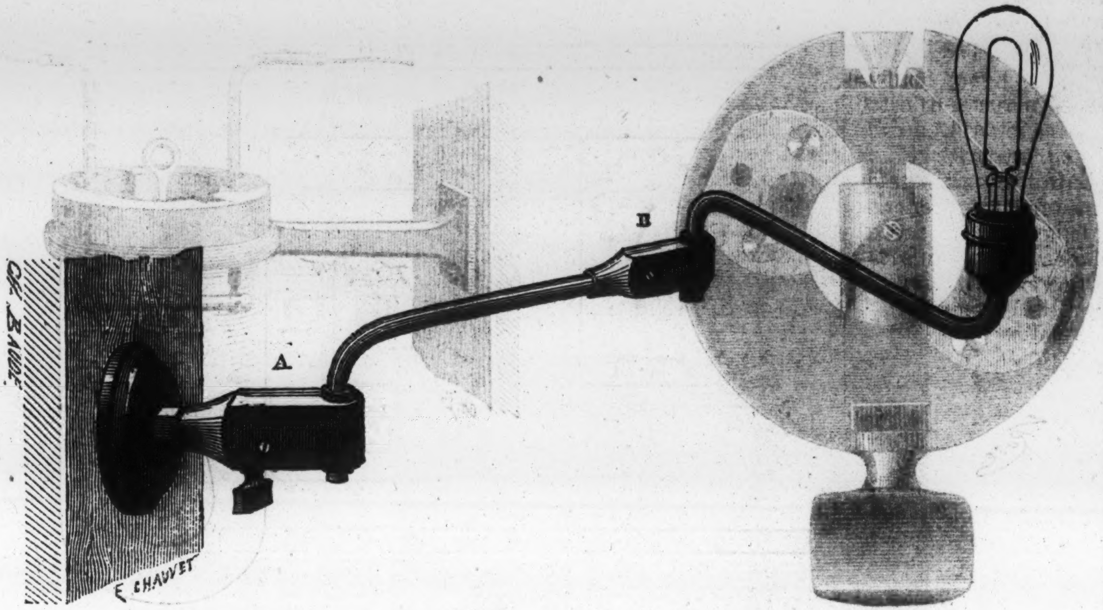


FIG. 15.

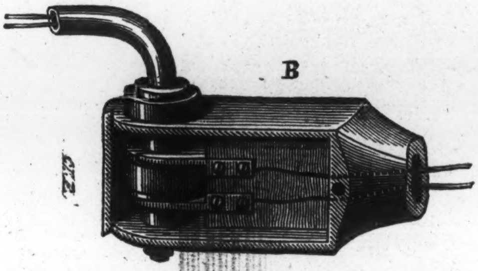


FIG. 17.

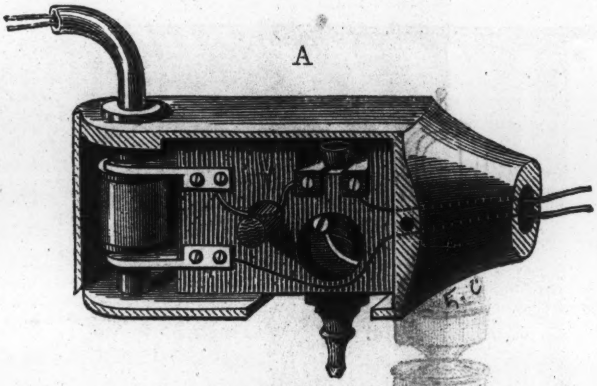


FIG. 16.

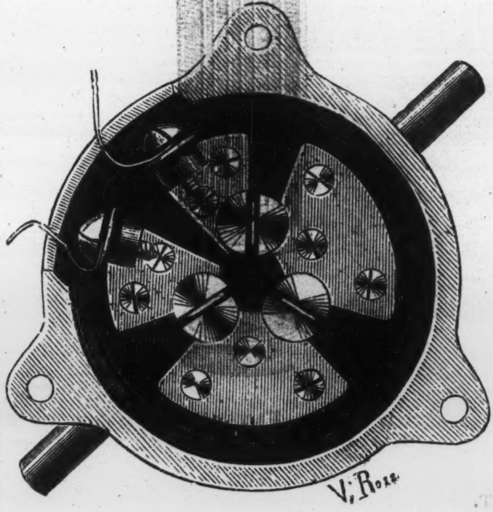


FIG. 20.

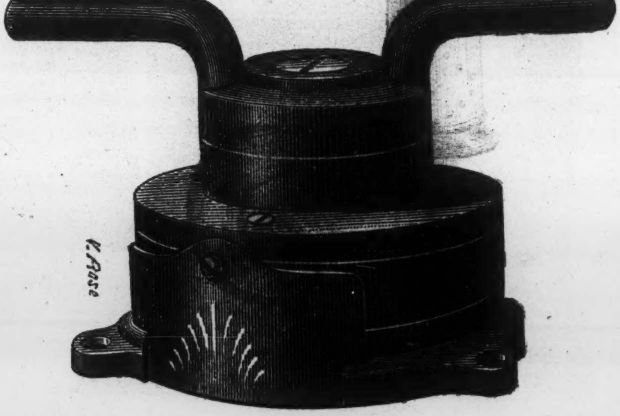


FIG. 19.

EDISON'S EXHIBIT.

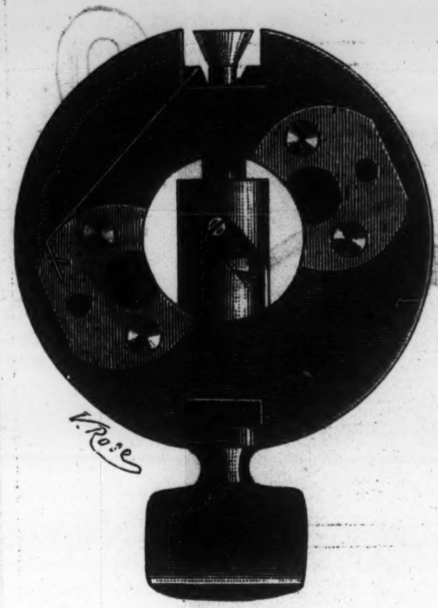


FIG. 18.

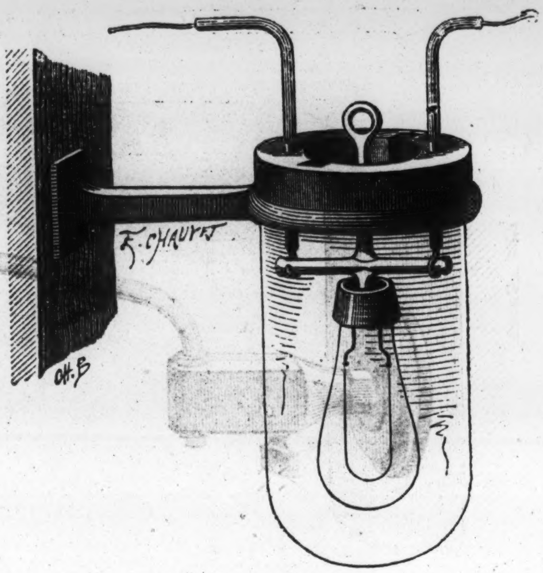


FIG. 21.

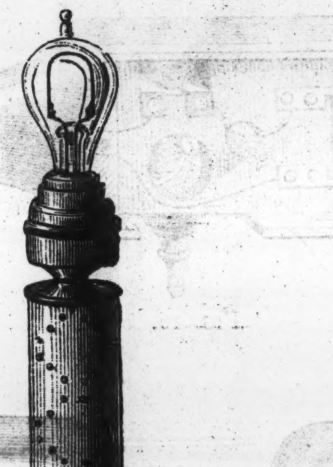


FIG. 22.

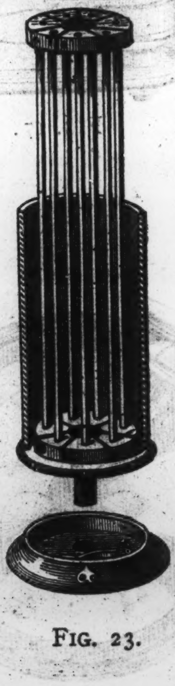


FIG. 23.

EDISON'S EXHIBIT.

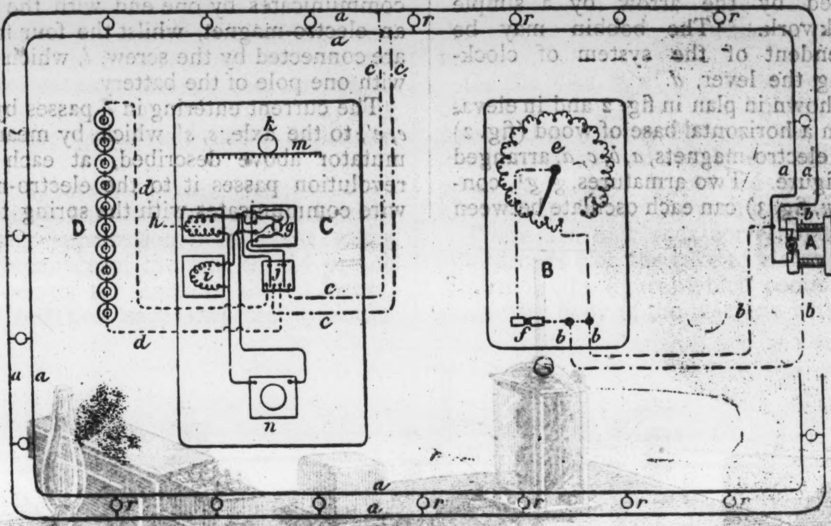


Fig. 25.

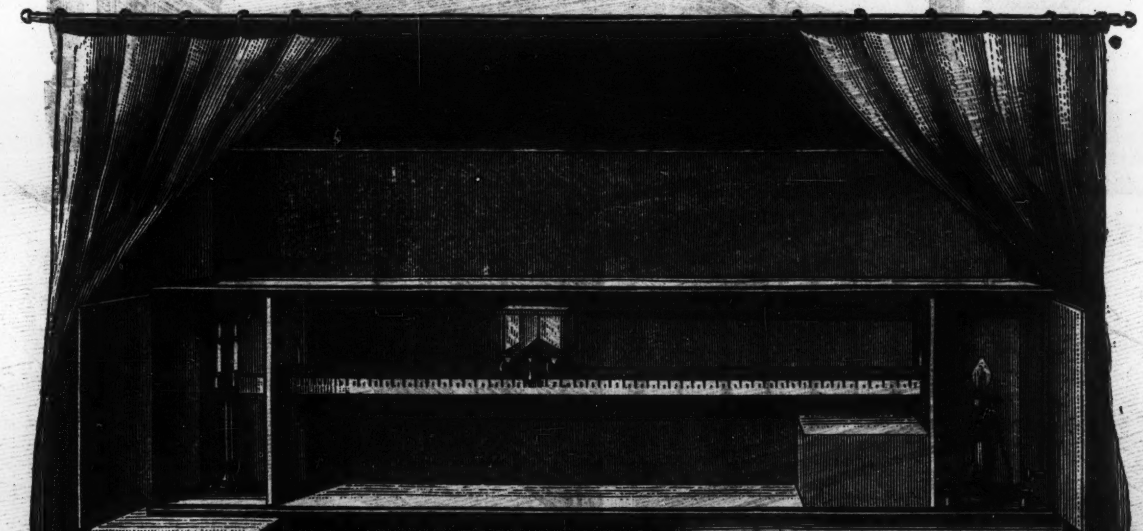


FIG. 26.—EDISON'S EXHIBIT.

The wire thus covered coils itself upon a large bobbin, R, which always tends to revolve in the direction indicated by the arrow by a simple system of clockwork. The bobbin may be rendered independent of the system of clockwork by lowering the lever, d.

The motor is shown in plan in fig. 2 and in elevation in fig. 3. On a horizontal base of wood (fig. 2) are fixed the four electro-magnets, a, b, c, d, arranged as shown in the figure. Two armatures, $g\ g^1$, connected below (in n, fig. 3) can each oscillate between the poles of the two electro-magnets as they are alternately attracted. This oscillatory movement of the two armatures is converted into a revolving action by means of the connecting-rods, $i\ i'$, which are geared to the cranks, $s\ s'$, of the fly-wheel, V. The wheel, r, which is on the same axis as V, has three grooves of different diameters, on which can be fitted the driving cord for the transmission of the movement. The same axle carries the commutator, consisting of two projections soldered upon the axle in two different vertical directions, and in different planes, so that they may come in contact respectively with the four springs, n, n', n'', n''', each of which communicates by one end with the helix, forming an electro-magnet, whilst the four free extremities are connected by the screw, l, which communicates with one pole of the battery.

The current entering in l passes by the supports, e, e', to the axle, s, s', which, by means of the commutator above described, at each quarter of a revolution passes it to the electro-magnet, whose wire communicates with the spring touched by the corresponding projection, so that in a complete revolution of the axle, the current passes successively to the four electro-magnets, causing the two armatures, g, g', to oscillate, and by means of the connecting rods, i, i', to set the wheel, s, s', in rotation.

This arrangement of the motor seems preferable to the one usually adopted, since it combines efficiency with simplicity. In fact, the current does not pass simultaneously into the different coils as in other motors of this kind, but passes successively and without any deviation in such a manner

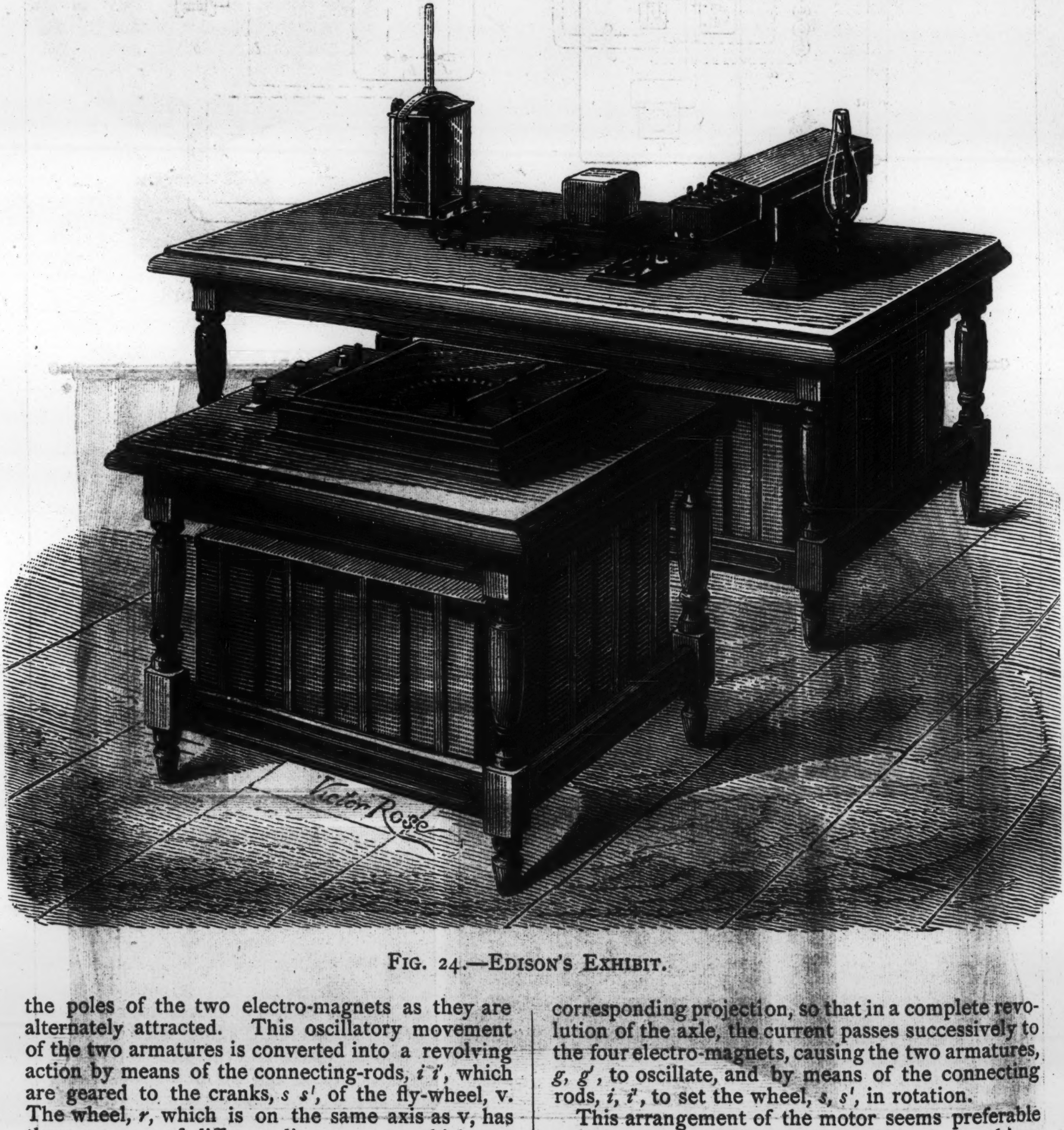


FIG. 24.—EDISON'S EXHIBIT.

that the electro-magnet acquires the maximum magnetic force. It will be easily understood how the above system may be adapted to three electro-magnets instead of four, arranged in three pairs. The axle will then be fitted with three springs, and the commutator will be formed of six springs and three projections, so as to convey the current to each coil at each sixth part of a revolution. By this arrangement greater power and more regularity would be obtained.

But the entire apparatus, as just described, does not satisfy the condition that it should work without requiring any supervision. It might easily happen that a breakage of the silk thread or the exhaustion of one of the bobbins should occur. In these cases it is necessary that the apparatus should stop automatically. This object is attained in the simplest manner by means of a mercurial interrupter, K (fig. 1). This is formed of an electro-magnet, *a*, which can draw down the lever, *m*, by attracting the armature fixed to it. The lever carries on its other arm two iron screws, *n*, *n'*, the ends of which plunge into two small cups of mercury; of these screws, *n* is always in contact, whilst the other comes into contact only when the lever is depressed. When the lever is in this latter position, the electric current before arriving at the motor passes through the two cups of mercury, as the apparatus is in action, until the circuit is closed by the metallic arch terminating in the two screws, but at the moment when it enters into action the electro-magnet, *a*, presses down the lever, *m*, on the side of the screw, *n'*, separating it from the mercury, with which it was in contact, and by breaking the circuit, brings the motor to a stand.

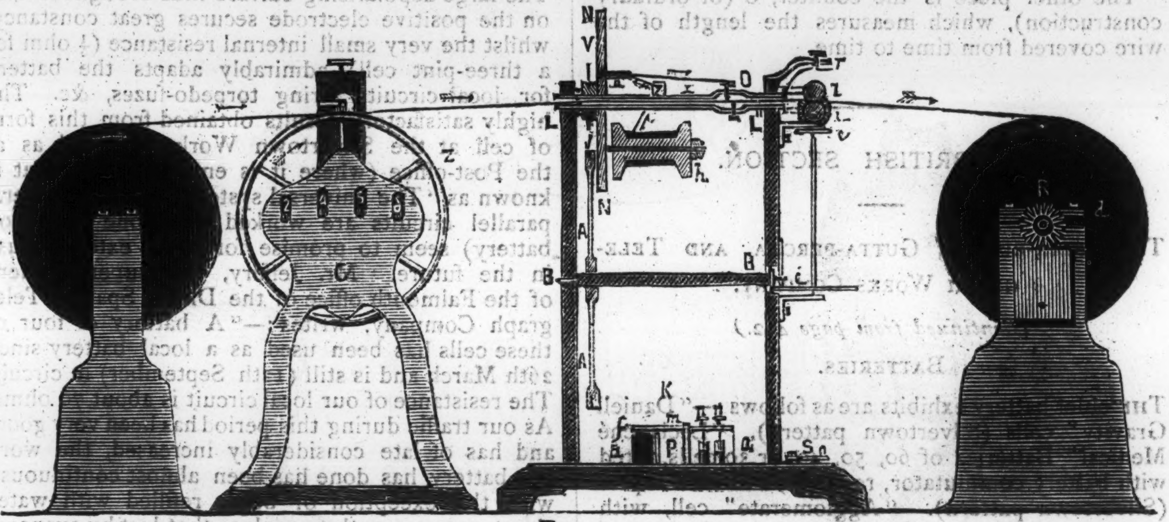


FIG. 1.

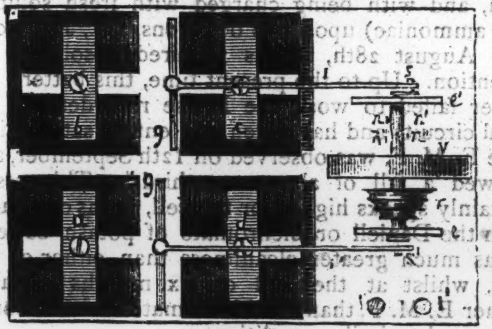


FIG. 2.

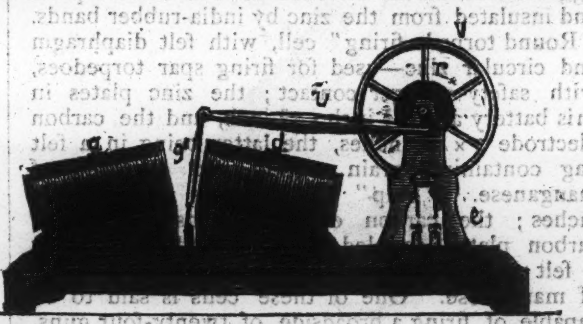


FIG. 3.

It remains to be shown how the current passes in the electro-magnet, *a*, when a thread of silk is broken.

On the disc, N, N', it will be seen that the thread of silk coming from the bobbin, *h*, after having passed through the orifice, *x*, enters first at *o* into another orifice made in the end of the rod, *n*, which when it is free, is pressed by a slender spring, always kept in contact with a metal disc, V.

There are four rods corresponding to the four silk threads (for the sake of clearness, only one is shown in the figure) which communicate through the entire body of the machine with one pole of the battery, whilst the disc, V, communicates with the other pole, including the electro-magnet, *a*, in the circuit.

As long as all the silk threads pass through the rods, they are all drawn away from the metal disc, V, and therefore the circuit is interrupted; but if one of the threads fails and leaves its respective rod, the latter comes in contact with the metal disc, the circuit is closed, and the electro-magnet, *a*, exerts its action, and brings the motor to a stand.

In order that the circuit may remain open when the apparatus is not in use and thus the waste in the battery be stopped, a mercurial interrupter is included in the last circuit, and the lever, *m*, is placed in unstable equilibrium by means of a screw, *g*. Thus the electro-magnet, *a*, fulfilling its office, interrupts the circuit simultaneously without turning the lever backwards.

To render the apparatus as complete as possible, two other pieces have been added which, though not indispensable, are of great advantage, especially when the machine has to work for a lengthened period.

The first of these is an electric bell, which is intended to give notice when a silk thread is broken, and that the machine has suspended its work. This is done by means of a little column, *p*, added to the interrupter, K, which plays the part of a commutator, and causes the current to pass from the motor to the bell; the latter will then sound until some one comes to open the circuit, which is done by means of an interrupter, *s*.

The other piece is the counter, C (of ordinary construction), which measures the length of the wire covered from time to time.

THE BRITISH SECTION.

THE INDIA-RUBBER, GUTTA-PERCHA, AND TELEGRAPH WORKS COMPANY.

(Continued from page 412.)

BATTERIES.

THE chief battery exhibits are as follows:—"Daniell Gravity" cells (Silvertown pattern). "Leclanché Medical" Batteries of 60, 50, 40, or 30 cells, fitted with battery commutator, reverser, and interrupter (Silvertown pattern). "Agglomerate" cell, with agglomerate blocks attached to the carbon plate and insulated from the zinc by india-rubber bands. "Round torpedo firing" cell, with felt diaphragm and circular zinc—used for firing spar torpedoes, with safety plunger contact; the zinc plates in this battery are $14\frac{3}{4}$ inch × $4\frac{3}{4}$ inch, and the carbon electrode $7 \times 4\frac{1}{2}$ inches, the latter being in a felt bag containing grain carbon and peroxide of manganese. "Ship" battery—zinc plate $35\frac{1}{4} \times 9$ inches; the carbon electrode consists of four carbon plates coupled together and inclosed in a felt bag containing grain carbon and peroxide of manganese. One of these cells is said to be capable of firing a broadside of twenty-four guns. "Six rod agglomerate" cell (Silvertown pattern). This latest new form of Leclanché cell, now being made in large numbers at the Silvertown works, is deserving of special notice. The favour which the Leclanché battery has met with on account of its high electromotive force, easy management, and cleanliness has hitherto been somewhat modified owing to its want of constancy. Under the influence of the current the peroxide of manganese is reduced to the sesquioxide, causing an increase in resistance, and the evolution of ammonia in considerable quantity is an additional element in reducing its constancy. An important improvement was no doubt effected in the earlier form by employing what are known as "agglomerate" plates, which obviate the use of porous pots, thereby decreasing the internal resistance of the battery and rendering the depolarising agent more effectual. But even with this improved form, experiment shows that when working through low resistances the electromotive force of the battery rapidly diminishes, though it recovers rapidly when the latter is inactive; it is in this polarising tendency that a very material improvement has been effected by the latest form given to the cell. The positive electrode consists of a fluted carbon rod having grooves of a rather smaller diameter than that of the agglomerate rods; six of these rods surround the centre rod and are held in close contact with it by india-rubber bands, so that the small spaces between the two facilitate the circulation of the liquid and the dissipation of the gas evolved; a coarse canvas bag prevents contact between the agglomerate rods and a circular zinc. The large depolarising surface thus brought to bear on the positive electrode secures great constancy, whilst the very small internal resistance ($\frac{1}{5}$ ohm for a three-pint cell) admirably adapts the battery for local circuits, firing torpedo-fuzes, &c. The highly satisfactory results obtained from this form of cell at the Silvertown Works, as well as at the Post-office (where it is employed for what is known as "The universal system," in which several parallel circuits are worked from one common battery) seem to promise for it an extended use in the future. Mr. Jeffery, the superintendent of the Falmouth office of the Direct Spanish Telegraph Company, writes:—"A battery of four of these cells has been used as a local battery since 26th March and is still (12th September) in circuit. The resistance of our local circuit is about 70 ohms. As our traffic during this period has been very good, and has of late considerably increased, the work this battery has done has been almost continuous; with the exception of being refilled with water about once a month to replace that lost by evaporation, and with being charged with fresh solution (sal ammoniac) upon two occasions, viz., July 10th, and August 28th, it has required absolutely no attention. Up to the present time, this battery has never failed to work the Morse recorder (on the local circuit) and has given me entire satisfaction. The E. M. F. was observed on 12th September, and showed a fall of about one-third." This result certainly speaks highly for the cell, for as compared with the Daniell or bichromate of potash battery, it has much greater cleanliness than either of the two, whilst at the end of six months it has a higher E. M. F. than the bichromate element could show under similar conditions.

TORPEDO APPARATUS.

The exhibit of torpedo apparatus is very interesting, and is as follows:—

Pair of "Telescopic firing arcs," for firing and converging stations, fitted with telescope, vernier, *sights* with platinum contacts attached, contact rod, spirit level, and levelling screws.

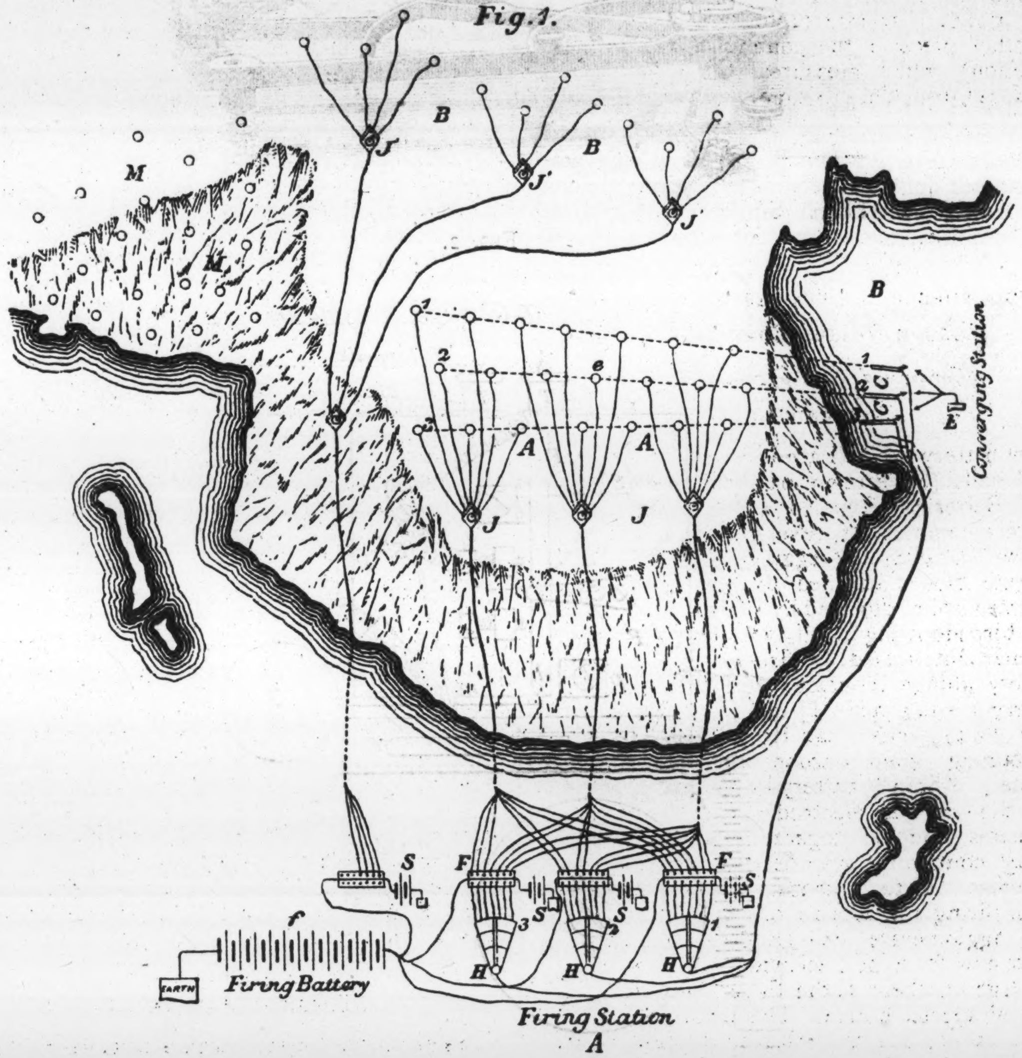
A "Seven shutter signalling and firing" instrument, consisting of automatic relay for switching the torpedo cable from the *signalling* to the *firing* battery, a shutter to indicate the number of the mine exploded, and bell to attract the attention of the operator.

"Mathieson's improved circuit closer"—used in connection with the *electro-contact system*—with coiled tapering spring. When set vibrating by the concussion of a passing vessel, this instrument gives a succession of contacts, each of which completes the torpedo circuit.

"Torpedo testing table," fitted with astatic detecter, a three-coil galvanometer, key, commutator, Wheatstone bridge, set of resistance coils, and clip for holding a definite length of platinum wire.

The remarkable development during the last few years in the science of submarine warfare, and the important *rôle* which it seems destined to play in the maritime wars of the future, induces us to enter somewhat fully into the existing electric torpedo systems, as it is a subject of considerable interest, and one to which the attention of many of our readers has perhaps been little directed.

Fig. 1.



Firing Torpedoes by Observation.

Fig. 1 is a sketch of an imaginary harbour, defended by submarine mines. A and B are, respectively, the *firing* and *converging* stations. The firing station is provided with the battery necessary to explode a mine, a firing arc, H, and key, a shutter *signalling and firing instrument*, F, for each group of mines, and a speaking instrument to communicate with the converging station, B. At the latter there are, in addition to the speaking apparatus, three converging arcs, C, C, and keys, one for each *line* of mines. A four-core cable connects the two stations, one conductor being required for each line of mines and the fourth (not shown in the figure) for telegraphing purposes.

There are three groups, A, A, each consisting of seven torpedoes, moored in three lines, converging, as shown, to the arcs, C, C, at station B. Single core cables connect these mines at the junction boxes, J, J, with the three seven-core cables communicating with the firing station. To simplify the arrangement on shore, the conductors are so joined up that each *line* of mines communicates with a separate *signalling and firing apparatus* and its telescopic firing arc.

The *firing arc*, fig. 2, consists of a cast-iron frame, *x*, with levelling screws and spirit level, and is fitted with a telescope, T, capable of vertical and horizontal movements, and also of being raised and lowered by a rack and pinion motion. The telescope is provided with cross wires, and carries a vernier, V, which follows every horizontal movement of the telescope, and traverses a graduated scale. A clamp screw is also provided to fix the telescope in any required position. On the outer arc of the frame are *sights*, *s*, with metallic V-contacts, *k*, attached to, but insulated from, the rest of the instrument. The position of these *sights* and their metallic contacts on the arc are made to correspond with the bearings of their respective mines, as fixed by careful telescopic observation, when the torpedoes are first moored; each sight is, moreover, labelled, to indicate the number of the mine. Rigidly connected to the upright which carries the telescope, and moving with it, is a brass rod, *r*, at the end of which is a spring contact, which passes over and rubs against the V-contacts, corresponding to the several mines. This movable rod is insulated from the framework and put in connection, through a contact key, with the cable leading to the corresponding arc at the converging station. The *converging arc* has also a telescope, the *sight* being very carefully adjusted so that the axis of the telescope passes through its particular line of torpedoes. The operator at this station is provided with a key by which he can put the cable leading to the corresponding firing arc to earth at will.

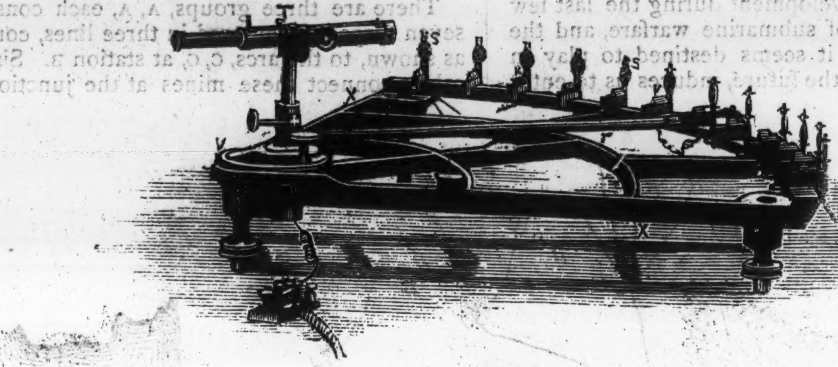


FIG. 2.

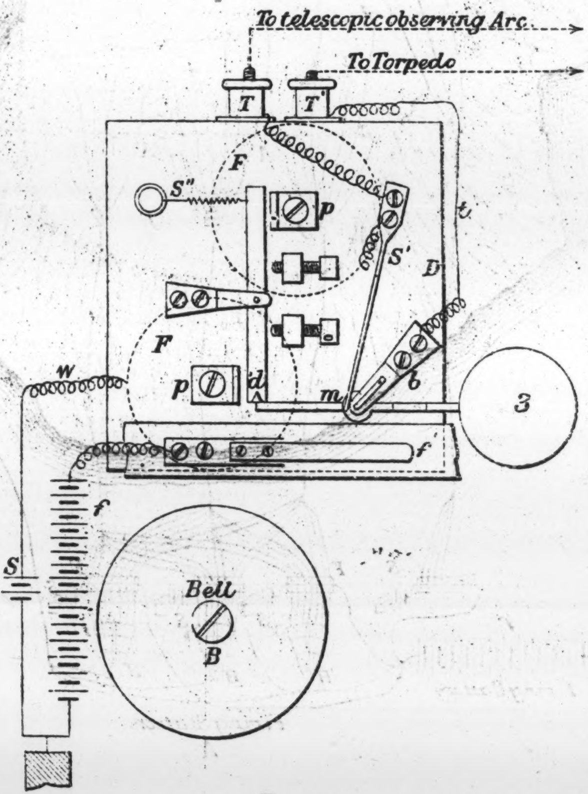


FIG. 4.

The Shutter *Signalling and Firing Instrument*, fig. 4, is in principle an automatic relay for switching the firing battery, *f*, into circuit and showing the number of an exploded mine, so that any breach in the line of defence is indicated. In the present instance, each instrument, of which there are three, consists of seven relays in one case, *i.e.*, one for each torpedo in one of the three converging lines of mines. Its construction is as follows : Secured to an electro-magnet, F F, is an ebonite plate, D, through which the soft iron poles, *p p*, protrude. Between these poles is the armature, pivoted at its centre, and held back, when not influenced by a current, by a light spring, s'', and limited in its movement by screws. A detent, *d*, at the lower end of the armature, presses against the end of a pendulous lever which is pivoted near its centre in the bearings, *b*, and has at its other extremity a metallic disc, or shutter, 3. A spring, s' (connected with one end of the electro-magnet coils and the terminal to which one of the contacts on the telescopic observing arc is attached) presses against a platinum tongue, *m*, on the pinion of the lever, so long as the latter remains in a horizontal position. But as soon as the current passes from the weak *signalling battery*, *s* (generally of only two cells), the armature is attracted and releases the lever, when the disc, 3, falls, breaks contact with spring, s^1, attracts attention by striking the bell, B, and at the same time engages the clip-spring, f^1, in doing which the firing-battery, *f* (one pole of which is to earth), is switched into the torpedo cable circuit, T, and the mine exploded. Moreover, the number on the disc, when the lever is in a vertical position, shows which mine has been fired.

In order to bring the above action about, it is necessary to put earth on at the terminal leading to the telescopic observing arc, T, and this is done by *both* the *firing* and *converging* stations pressing their keys simultaneously ; for, since the earth plate, E, is at the *converging* station, it is only by their joint action that the firing battery can be switched into the torpedo circuit.

It will be seen on referring to the connections in fig. 4, that if a *good* earth be made in the torpedo cable circuit the same result will follow. This is what actually happens when a *circuit closer* is employed in connection with a torpedo, as will presently be described.

Let us take the case of an enemy's ship approaching the first line of torpedoes. The operator at the firing arc, I, who controls the whole advanced line of torpedoes, follows carefully the movements of the vessel by turning his telescope from one fixed sight to another, as the vessel changes position, closing at the same time the V-contact, corresponding to the sight at which the telescope rests, by means of the contact rod, *r*, and pressing down his key as long as the vessel is within striking distance. Meanwhile, the observer at the converging arc, I, waits till the vessel is crossing his *line*, and only keeps his key down so long as the vessel is covered ; directly she has passed the line he opens his key. If while the vessel crosses B's first line the operator at A cannot cover her with any of his sights, he does not close his key, because the ship is evidently passing between two torpedoes and on to the second line of mines. The same operation is then gone through between firing and converging arcs No. 2, and only when the vessel is passing over a spot where the lines of a sight on the firing and corresponding converging arc intersect each other will both keys be down and the torpedo exploded. Suppose the ship to have passed the first line and be crossing torpedo marked *e* in the second line, in order to fire that mine the operator at firing arc, 2, will have his telescope on his middle sight and his key down, while the operator at station, B, will simultaneously be pressing the key corresponding to his telescope which commands the middle line of mines. In this case the current from the signalling battery, S, passes through the coils of the signalling and firing instrument, F, to terminal, T, to contact of firing arc, 2 (corresponding to torpedo, *e*), then to conductor of cable connecting firing arc, 2, with converging arc, 2, and thence by key to earth. The result is that the armature, *p*, *p*, is attracted, and trips the lever so that the disc falls, breaks contact between the tongue, *m*, and the spring, s^1, switches in the firing battery (usually of 100 cells Leclanché), and allows the current to pass from spring, f^1, through lever of shutter, bearings, *b*, and so by torpedo terminal, T^1, to explode the mine. On referring to the figure it will be seen that so long as the lever of the signalling and firing instrument is in its normal horizontal position, the terminals, T and T^1, are virtually one, being in metallic connection through the spring, S^1, hence a circuit closer floating above the torpedo (fig. 9), and operated by the concussion of a passing vessel, performs precisely the same functions as that accomplished by the two operators on shore ; in fact, the two systems, firing by *observation* or *intersection*, and what is known as the *electro-contact system*, are generally employed together, and are both entirely independent of each other. It will, of course, be at once apparent that the arrangement of the torpedo-fuze must in each system be different. In the electro-contact system platinum wire fuze is used, which has a comparatively small resistance, so that when a ship strikes the *circuit-closer* and puts earth on, the signalling battery of two cells is ample to work the signal and firing instrument ; whereas, when firing by *observation* a high tension fuze or some electro-magnetic switch arrangement in connection with a separate platinum fuze is employed, with a resistance too high for the signalling battery to work through effectually, but which is readily made to fulfil its function by the heavy firing battery. The

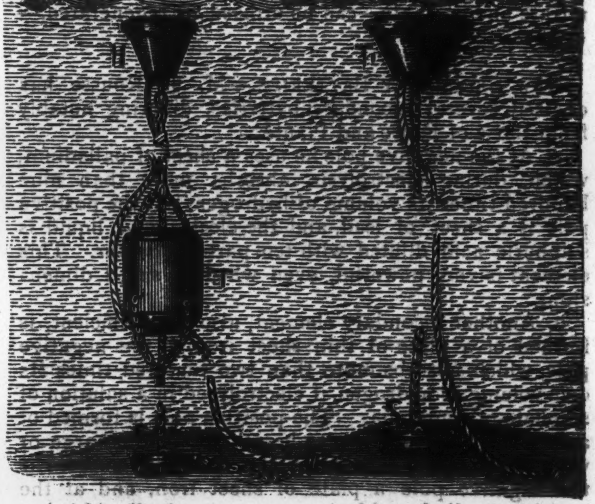


FIG. 9. FIG. 10.

electro-contact system is clearly practicable by day or night, while firing by observation is limited to clear weather; but, on the other hand, the electro-contact system, to be operative, requires that a vessel actually strike the *circuit-closer*, and taking into consideration that torpedoes have to be moored a considerable distance apart so that the bursting of one may not explode its neighbour, a breach in the line of obstruction would necessarily reduce the chance of a ship coming into collision with an electro-contact mine, whereas it might easily pass near enough, if not to be destroyed, at any rate to be disabled by torpedoes fired by observation, so that the one system is a powerful auxiliary to the other.

(*To be continued.*)

Notes.

A NEW BATTERY.—M. J. Rousse proposes to substitute ferro-manganese for the zinc in the Bunsen element. A battery thus constructed has the same electromotive energy as one with amalgamated zinc. The advantage of this new battery depends on the circumstance that the salts of manganese produced—the nitrate and sulphate—can be utilised or regenerated.—*Comptes Rendus.*

NEW SECONDARY BATTERIES.—M. J. Rousse has devised several secondary batteries, differing notably from those of Faure and Planté.

1. At the negative pole he uses a sheet of palladium, which, during electrolysis, absorbs more than nine hundred times its volume of hydrogen. At the positive pole is a sheet of lead, and the electrolysed liquid is sulphuric acid diluted with ten parts of water. This element is very powerful, even when of small dimensions.

2. Another secondary element, also very efficient, is formed of a plate of thin sheet iron at the negative pole, which absorbs more than two hundred times its own volume of hydrogen, if electrolysed in a solution of sulphate of ammonia. The positive pole is formed of a sheet of lead, which may be coated with litharge or white lead. The author has also used with success at the negative pole a plate of sheet iron, and at the positive a cylinder of ferro-manganese, the liquid being a solution of sulphate of ammonia. He lays down the general rule that to form a secondary battery it is sufficient to place at the negative pole of the voltameter a metal which has the property of absorbing hydrogen, when immersed in a suitable liquid, as at the positive pole, a metal which absorbs oxygen or peroxidises itself.—*Comptes Rendus.*

THE ELECTRICAL UNITS.—M. Dumas communicated to the French Academy of Sciences the definitions of the terms, ampère, volt, ohm, farad, and coulomb, as formally adopted at the recent Congress of Electricians.—*Comptes Rendus.*

STEEL MELTING BY ELECTRICITY.—M. Dumas also described the remarkable results of an experiment performed by M. C. W. Siemens, in the Palais de l'Industrie. Several kilos of steel were melted by the electric current in a crucible of magnesia. The fusion, effected in fourteen minutes, merely requires that an electro-dynamic machine should be set in motion at an outlay in fuel less than would have been required for direct fusion in an ordinary furnace.

TELEPHONE EXPERIMENTS IN SYDNEY.—The *Sydney Mining Herald* reports some experiments which have been made by the representatives of the Crossley Telephone Company, of London, between Melbourne and Albury, a distance of 200 miles, and between Sydney and Parramatta "with the most satisfactory result, the conversation carried on between these places being as distinct as that of two persons in the same room."

THE WHEATSTONE FAST-SPEED APPARATUS.—We understand that the Western Union Telegraph Company (America) have given an order for 12 complete sets of the Wheatstone automatic fast-speed apparatus to be sent out from England, the intention being to work the same on the company's lines. As the Wheatstone instrument does not profess to work at the extreme high speed which is claimed for more than one transatlantic apparatus, it is somewhat significant that its employment should be determined on.

THE S. S. HOOPER.—The telegraph s.s. *Hooper* has been bought by the India-Rubber, Gutta-Percha and Telegraph Works Company. The ship, which is to be renamed the *Silvertown*, is the largest cable ship afloat. Her measurements are:—Length over all, 350ft.; beam, 55ft.; moulded depth, 36ft.; gross tonnage, 4,935 tons; net register, 3,724 tons. She has three cable tanks, each 30ft. deep, and having respectively the diameters 41ft., 53ft., and 51ft., with the usual cable gear. The ship leaves England in March to assist in laying the 3,000 miles of cable now being manufactured by the company for the west coast of South America.

ON the 14th and 23rd ult. gales of unusual violence swept over the United Kingdom, doing much damage to the telegraph plant throughout the country. From reports received, it appears that the major portion of the damage to the land lines was caused by the falling on the wires of uprooted timber, and that to the submarine lines by the anchors of drifting vessels. The east coast of Scotland has perhaps suffered most in this respect; the two cables in the Firth of Forth, connecting Granton with Burnt Island, being broken, and communication between these points being completely interrupted.

THE JERSEY CABLE.—The recent interruption in the Jersey cable appears to have been caused by a somewhat unusual kind of fault. The cable parted near the shore; but instead of an "earth" fault being caused thereby, the gutta-percha closed over the broken end and sealed up the break, thus producing a "disconnection."

A MYSTERIOUS DOCUMENT.—In 1783 the French Academy of Sciences was called upon to examine an invention which seems to have anticipated in some way the electric telegraph. It was stated that by its means a message could be transmitted in a few seconds over a distance of 30 leagues without intermediate station. Condorcet, the reporter for the commission of examination, stated that the system was ingenious and practicable. In order to insure the rights of the inventor, a sealed packet containing the details was deposited with the Academy. M. Aglave has written to inquire whether this packet ought not to be searched for in the archives of the Academy, and to suggest that now that a century has almost passed since it was deposited, the rights and wishes of the inventor would not be outraged if it were to be opened. The administrative council of the Academy have been instructed to give the matter their attention.—*Mechanical World.*

The Paris Exhibition.—It has been decided that the Paris Exhibition is to close on the 17th of the present month.

The Shetland Cable.—On the evening of the 26th ult. telegraphic communication between the mainland and Shetland was restored after an interruption of upwards of six months.

Underground Telegraphs in Germany.—The system of underground telegraphy devised by Dr. Stephan, Postmaster-General of Germany, is now completed. On the 14th of March 1876, the first line of cable from Berlin to Halle was commenced, and on the 26th of June, 1881, the system was completed by laying the cable from Cologne to Aix-la-Chapelle. In eighteen months eighteen lines have been laid, comprising, according to the *Algemeiner Anzeiger*, 3,394 miles of cable, costing 30,200,000 marks (£1,510,000). The 18 lines connect 221 towns, including the most important places of commerce and chief fortifications of the German Empire. The conductors in the 3,394 miles of cable have a total length of 23,213 miles. The weight of the materials consumed in manufacturing these cables was 12,825 tons, consisting of 10,165 tons of iron, 823 tons of copper, 837 tons of gutta-percha and hemp, and 383 tons of asphalte. In the crossing of rivers 70 cables were required.

Dangerous Telephone Wires and Underground Lines.—An inquest has been held in Birmingham on the body of James Trueman, who was killed by the fall of a chimney stack during the recent gale. It was stated that a wire belonging to the British and Irish Telephone and Electric Works Company was fixed to the chimney in question, and that the wire broke near to the stack. A builder was of opinion that if the wire had not broken, or if it had never been attached to the chimney, the stack would not have fallen. The jury returned a verdict of death by misadventure, but added that in their opinion it was dangerous to the public safety to fix wires to chimney stacks, that they were surprised that the Corporation allowed the wires to be so fixed without proper supervision, and that the only safe course to adopt was to carry such wires underground.

The Society of Arts.—The following are among the papers announced to be read during the next session of the Society of Arts: "Telephonic Communication," by Lieut.-Col. C. E. Webber, R.E.; "The Storage of Electricity," by Prof. Sylvanus Thompson, D.Sc.; "The Distribution of Time by a System of Pneumatic Clocks," by J. A. Berly, C.E. The usual short course of juvenile lectures, given during the Christmas holidays, will be by Mr. W. H. Preece, F.R.S., the subject being "Recent Wonders of Electricity." The following papers, which indirectly bear more or less on the electric light question, will also be read: "The Production and Use of Gas for Purposes of Heating and Motive Power,' by J. Emerson Dowson; "Gas for Lighthouses," by John Wigham (illustrated by an exhibition of some of the gas flames and apparatus used in lighthouses).

The Electric Light by Tidal Power.—At a recent meeting of the Bristol Town Council, a proposition was submitted to utilise the rise and fall of the tide on the Avon as a motive power in connection with illuminating the city by the electric light, but it was stated that a committee had been investigating the merits of the various systems, and that they considered it desirable to wait their further development.

Johnson's Carbon Telephonic Transmitter.—The Preston Board of Guardians have selected Mr. Johnson's carbon transmitter for the line of telephonic communication which it is intended to establish between Fulwood workhouse and the Union offices. This instrument was tested against the Blake, and also the Gower transmitter, and found, it is stated, to be superior to both.

The Electric Light at Chesterfield.—In consequence of the success of the experiments made in lighting the streets of Chesterfield by the electric light, the Watch and Lighting Committee have made an arrangement for the lighting of the town for one year for a sum less than that paid per year to the gas company by a considerable amount.

The Electric Light in Canada.—The engineer of Ottawa has reported against the proposal to light the city by electricity. The present cost of doing so by gas is stated to be £2,546. Electricity generated by steam would cost £4,960, and, if water power were utilised, £3,200.

The Electric Light in Turkish Lighthouses.—The Turkish Government is at present studying the question of electric lighting of the lighthouses along Turkish coasts. A Frenchman, M. Michel, has been charged with the erection of the new lighthouses projected on the shores of the Red Sea. An international commission has met at Constantinople to fix the tariff of those lighthouses, which are greatly required for navigation.

Influence of Electricity on the Growth of the Vine.—M. Macagno, in *Les Mondes*, states that he has been making experiments on the influence of electricity upon the growth of the vine. An electric circuit was formed by copper wire between the extremity of a branch bearing fruit and its origin near the soil. More wood was formed in the branch, which contained less potash than the other parts, and the grapes ripened more readily, containing an excess of sugar.

The Society of Telegraph Engineers and of Electricians.—At the first meeting of the session, commencing on Thursday, November 10th, Mr. John Alexander Lund will read a paper on the system of synchronising clocks adopted in London and elsewhere, with an exhibit of a complete set of all the various instruments connected with its working.

Another Application of Electricity.—The newspapers mention that "what is supposed to be an infernal machine of rude construction has been found on the roof of the Masonic Hall at Dingwall. It is inclosed in a small wooden box, and contains a roughly modelled electric apparatus and a quantity of dynamite or other explosive substance. It has apparently been constructed by some person acquainted with electricity.

Electric Communication with Lighthouses.—The Lord Mayor, M.P., has received the following letter from the Prime Minister:—"10, Downing Street, Whitehall, Oct. 31.—My Lord Mayor,—I have had the honour to receive from you a copy of resolutions passed by a meeting held at the Mansion House with respect to telegraphic communication between lighthouses and lightships and the shore, and have at once forwarded them for consideration to the Board of Trade.—I have the honour to be, my Lord Mayor, your most faithful and obedient servant, W. E. Gladstone."

TELEPHONIC.—Threatening notices having been sent by the United Telephone Company to the subscribers to the Plymouth Exchange, counter-action has been commenced by Mr. Pope Cox, the proprietor, who lays his damages at (we hear) £10,000. In reference to this matter the Post Master General advertises that he has at present licensed no other exchange than that worked by Mr. Cox.

THE Lancashire and Cheshire Telephone Company (provincial branch of the United Company of London) has purchased the business of Messrs. Moseley and Sons of Manchester, and, we are informed, has appointed Mr. Moseley manager. (Another sale effected!)

THERE is in course of formation, amongst those interested in telephonic inventions other than Bell's or Edison's, a syndicate for mutual defence in "Telephone Infringement" law-suits. Something of this kind was attempted some time ago, but so long as the United Company can find the money wherewith to buy, unity in defence amongst those who are *indifferent* whether their money is made alone or in company (so long as it is made) is almost an impossibility. Most men will take what they considers their price and—clear out.

New Patents—1881.

4654. "Lighting by gas and electricity combined." R. H. COURTENAY. Dated October 25.

4664. "Electrometers." J. IMRAY. (Communicated by J. C. Carpentier.) Dated October 25.

4670. "Improvements in metallic pillar posts and columns for telegraphic and other purposes and in the machinery employed to produce the same." R. B. LEE. Dated October 25.

4694. "Apparatus for actuating signalling apparatus on railways by means of electricity." E. EDWARDS. (Communicated by E. Lesbos.) Dated October 27.

4695. "Method and means for utilising electric-circuits for various purposes, such as telephonic and telegraphic communication, controlling or synchronising time measures, fire or burglar alarm systems, and the like." W. F. BARNETT. Dated October 27.

4748. "Galvanic or electric batteries." W. R. LAKE. (Communicated by J. F. Aymonnet.) Dated October 29.

4758. "Apparatus for the transmission of vocal and other sounds." F. J. SMITH. Dated October 31.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1881.

768. "Connecting the carbon ends to conducting wires in electric lamps." E. G. BREWER. (A communication from abroad by Thomas Alva Edison.) Dated Feb. 23. 6d. Consists in uniting the carbon to the wires in any suitable manner, and then electroplating the point of union, thereby making permanent the union and at the same time making perfect electrical contact between the carbon and the conductors.

879. "Electric light signalling." ARTHUR SHIPPEY. Dated March 1. 4d. Relates to improvements in electric light signalling, chiefly applicable for use at sea, for the purpose of assisting in the saving of life, also for signalling for military and other purposes. A balloon or kite has suspended from it an apparatus provided with an electric light lamp. When it is required to give a signal the balloon or kite is allowed to ascend to the required height, which may be regulated by the quantity of cord or wire unwound from a windlass. The wire or cord is then connected with the battery or other generator of electricity so as to produce an electric light in the lamp.

894. "Electric lamps." J. J. SACHS. Dated March 2. 6d. Relates to improvements in electric lamps. The two carbons are placed in tubes arranged side by side, either vertically or at an angle, with the bottoms of the carbons resting upon a plate or upon the side of a body of a globular or other suitable shape, such plate or body being composed of asbestos, porcelain, or other suitable material. At the point of contact of the carbons with the plate or body, the latter may be perforated so as to admit of the emission of the light whilst preventing the carbons from passing through. As the carbons wear, they descend by gravitation, assisted if necessary by a weight or spring, and are thus always maintained in contact with the plate or body so as to insure constancy and uniformity in the light.

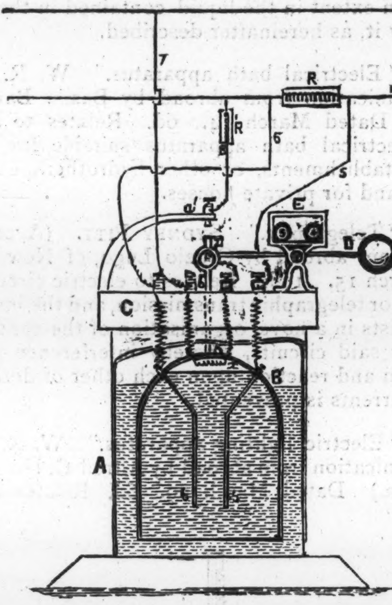
918. "Producing audible signals on railways by electricity." E. TYER. Dated March 3. 8d. Relates to means for giving audible signals which may serve in lieu of the usual signals when these are obscured, or which may be employed along with the visible signals as additional means of securing the driver's attention. For this purpose at the distant signal, or preferably at some distance in advance of it, a gong or bell is mounted, having its hammer worked by the armature of an electro-magnet, the coil of which is intermittently excited by electrical currents transmitted from a battery. These electrical currents are intermitted by means of a rotating commutator caused to revolve by clockwork, which clockwork is kept wound up so as to be ready to start when required; for the purpose of starting it, an electrical contact apparatus is arranged at the side of the rail at a point some distance in advance of the gong or bell, so that on a train passing this point it, by depressing a trigger or by causing deflection of a rail, effects the required contact.

925. "Telephone transmitters." C. MOSELY. Dated March 4. 6d. Relates to the construction of apparatus for transmitting sound by the aid of electricity, and having for their object the reduction in the amount of electrical resistance in the transmitter and the attainment of an increased intensity of sound in the receiving instrument, and consist in the employment of precipitated sulphide of copper in a loose form or consolidated by pressure.

977. "Electric and automatic signalling apparatus." ERNEST DE PASS. (A communication from abroad by Hippolyte Leblanc and Eugène Victor Achille Loiseau, both of Paris.) Dated March 8. 6d. Consists in the combination of various apparatus, which together serve as a novel means for electric and automatic signalling for operating the signal discs on railways, and especially those discs on Leblanc's system.

991. "Galvanic batteries." GEORGE F. REDFERN. (A communication from abroad by Siegfried Marcus, of Vienna.) Dated March 8. 6d. Relates to improvements in galvanic batteries, equally applicable for military as for domestic purposes. The improvements also relate to the general arrangement of the parts forming the battery, particularly to the construction and employment of what may be termed a permanent element, and of a device whereby the usual earthenware porous pots now generally employed are not required. (*Provisional only.*)

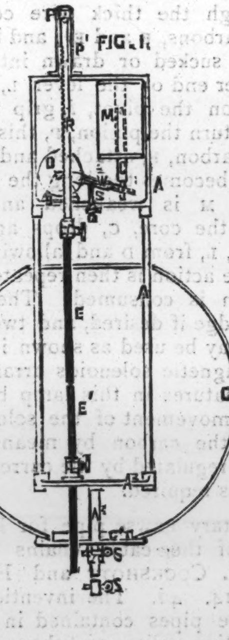
1016. "Veber-meters." E. G. BREWER. (A communication from abroad by Thomas Elva Edison.) Dated March 9. 6d. Relates to apparatus for measuring an electric current. One part of the invention for this purpose consists in deflecting a definite proportional part of the current to be measured and passing it through a vessel partially filled with water and floating in the same liquid. The water in the vessel is decomposed by the current, and the gases formed displace a portion of the water in the vessel, lessening its specific gravity and causing it to rise. The rising of the vessel causes the lifting of a lever connected with a registering mechanism, so that the amount of gases produced being proportional to the current passing through the vessel, and this in turn proportional to the main current, the last may be indicated by the register. Such arrangement is made that when a definite predetermined amount of decomposition has taken place the vessel will rise to a sufficient height to close an electrical circuit, which will send a current through the gases and explode them, so that they will be re-composed into water and the vessel again fall. These operations being repeated so long as current passes. Figure 1 is a view of an apparatus for this purpose; A is a tank of water, and B a vessel also containing water floating therin; 1, 2, is the main circuit from which, by means of the resistance placed at R, a definite portion of the current is deflected into the circuit, 5, 6. This circuit passes through the water in the vessel, B, and returns again to the main circuit. 7, 8, is a third circuit from the main one, and is broken at the contact points, *a*, *a*¹. C is the top of the tank, A. It supports a suitable registering apparatus, E, and the contact *a*¹, and the wires of the circuit, 5, 6, and 7, 8, passes through it. Also passing through C is the projection, *b*, which extends up from the vessel, B, operating the lever, D, of the registering apparatus, and terminating in the contact point, *a*. As above stated, in consequence of the resistance, R, a definite portion of the current is deflected from the main current into the wire, 5, and passes down through C into the vessel, B. The lower portion of this current, 5, 6, is completed by the water, and the current in passing through it decomposes a portion thereof, which rises in a gaseous form to the surface. As the upper portion of the vessel becomes filled with these gases, the specific gravity of the whole is lessened and the vessel rises, carrying with it the projection, *b*, and thus moving the lever, D, which operates the register. When the upper part of the vessel, B, is entirely filled with the gases it rises to such a height that the contact, *a*, will meet *a*¹, and close the circuit, 7, 8. A current of electricity immediately passes along this circuit heating the platinum coil, *x*, and causing by explosion the recomposition of the gases into water. The vessel, B, then falls to its former position, re-opening the circuit 7, 8, and the current again passes through the circuit, 5, 6. This operation is of course continually repeated. A resistance placed at R¹ prevents the passage of too large a current of electricity through the circuit, 7, 8. Another portion of this invention consists in an arrangement for measuring an electric current as follows:—An electric depositing cell has a metal lining which forms one of the electrodes thereof, being connected in any suitable manner with one of the leading wires. The other electrode is a piece of metal suspended within the cell by a spring, the stress of the spring being so adjusted that the metal piece will be sustained at the top of the cell when there is a minimum of deposition thereon, while the maximum of deposition will cause it to sink to the bottom. An index arm is attached to the metal piece and a scale provided in connection therewith, so that the amount of deposition will be visually indicated. The electrodes are also connected with a registering apparatus and circuit reversers which change the direction of the current through the cell, and consequently reverse the anode and the cathode, so the metal is first deposited on and then removed from the metal piece, causing it to rise and fall, so that the registering apparatus works whenever the circuit is reversed.



1027. "Electric lamps." J. A. BERLY. Dated March 10. 4d. Consists in hinging the movable electrode in the Jamin lamp by means of a spring instead of a pivot. (*Provisional only.*)

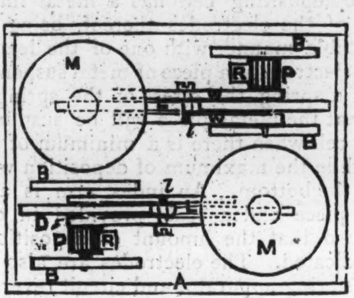
1040. "Electric lamps." A. A. COMMON and H. F. JOEL. Dated March 10. 6d. Relates to certain improvements in electric light arc lamps or regulators, and also to improvements in the construction of incandescent electric light lamps. The improvements in electric light arc lamps or regulators consists essentially of a simple device and apparatus for striking and controlling the arc actuated by a solenoid, also of various devices for feeding and regulating the length of arc. Figure 1 shows a sectional elevation of a complete lamp, and figure 2 a plan of same. In the box or

FIG. 1.



frame, A, is mounted on bearings, B, a pinion, P, and large disc or wheel, D; into the pinion, P, is geared the rack, R, to which rack top electrode, E, is attached; on the other end of the rack, R, is a piston head, P, which almost fits into a cylinder, P^1, the said cylinder, P^1, being filled with glycerine or other fluid. As the rack, R, falls the glycerine must pass through the orifices

FIG. 2.



shown by dotted lines in P, and so retard and regulate the fall of R. On the axis of P are attached two weighted arms, W, between which arms a gripping lever, L, is pivotted at l; the said arms, W, rest upon the adjustable support, S. On the other side of the box is an electro-magnet solenoid coil, M, one part or section being wound with thick wire in the main circuit, the other part being wound with fine wire of suitable resistance and in reverse direction to the thick wire and connected to shunt across the arc as is well understood. In the centre of this coil is an iron core, C, he bottom end of this core, C, being connected loosely to the end of gripping lever, L. At the bottom of the lamp is shown the globe, G, the lower electrode E^1, the rames, A^1, A^2, A^3, and the globe holder, G^1, with an arrangement, g, g^1, for lowering the globe. The action of this lamp is as follows:—When an electric current is sent through the thick wire coil of M, it passes through the carbons, E and E^1, and back to its source, the core, C, is sucked or drawn into the coil, M, and raises the lower end of the lever, L, causing the other end to move on the pivot, l, grip the disc D, at the point, l^1, and turn the pinion, P, this raises the rack, R, with the top carbon, E, attached and so strikes the arc. When the arc becomes too long the action of the thick wire coil on M is weakened and the shunt coil strengthened, the core, C, drops again, releasing the gripping lever, L, from D and allowing the rack, R, to fall; the above action is then repeated, and so on until all the carbon is consumed. The disc, D, may be milled on its edge if desired, and two sets of gear with two carbons may be used as shown in plan, figure 2, or two electro-magnetic solenoids arranged side by side, the essential features in this lamp being the transferring the large movement of the solenoid core to a fine movement of the carbon by means of the disc and gripping lever regulated by the current and feeding the carbon down as required.

1087. "Rotary hawse pipe for keeping submarine cables clear of the cable chains when the ship is swinging." T. COCKSHOTT and H. M. GOODMAN. Dated March 14. 4d. The invention consists of two rotating hawse pipes contained in one casting, and carried on friction rollers or other suitable bearings in flanges or framing fixed to the ship's bow. The hawse pipes consist of a larger and smaller one, the larger being concentric with the rotating casting and intended for the ship's cable, and the smaller one at one side, their axes being parallel. The revolving casting is rotated by means of a lever or levers inserted in one or other of a series of mortices on its periphery, or by spur or bevel gear or other suitable mechanical means.

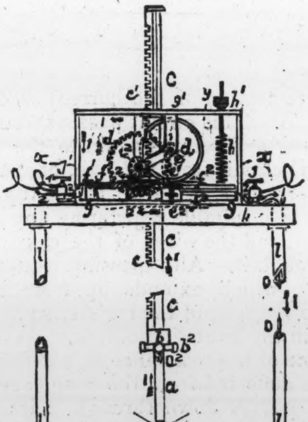
1094. "Automatic rapid telegraphy." B. J. B. MILLS. (A communication from abroad by W. A. Leggo, of Hartsdale, America.) Dated March 14. 8d. The object of this invention is to furnish a system of automatic rapid telegraphic transmission in which one machine may be used both for the preparation for transmission, and for the transmission of messages.

1097. "Voltaic batteries, &c." J. H. JOHNSON. (A communication from abroad by La Société Anonyme la Force et la Lumière Société Générale d'Electricité, of Paris.) Dated March 14. 6d. Relates to electric or voltaic batteries, and it consists in the employment in the construction of the said batteries of vessels or receivers made narrow at the lower part and wide at the upper part, the said vessels being filled with a suitable liquid and superposed in any desired number and arranged in such a manner that each vessel is immersed to a certain extent in the liquid contained in the vessel next below it, as hereinafter described.

1107. "Electrical bath apparatus." W. R. LAKE. (A communication from abroad by Basile Barda, of Vienna.) Dated March 14. 6d. Relates to an improved electrical bath apparatus suitable for public bathing establishments, or other hydrotherapeutic institutions and for private houses.

1119. "Telegraphy." SYDNEY PITT. (A communication from abroad by Orazio Lugo, of New York.) Dated March 15. 10d. Relates to electric circuits for telephonic or telegraphic transmission, and the improvement consists in a novel organisation of the conductor-composing said circuits, whereby interference arising from action and reaction upon each other of derived or induced currents is prevented.

1384. "Electric lighting apparatus." W. R. LAKE. (A communication from abroad by Alfred G. Holcombe, of America.) Dated March 29. 6d. Relates to improvements in electric lighting apparatus. Figure 1 is a side elevation partly in section of an electric lighting



apparatus, in which the current is divided to actuate independent feeding and arc-forming devices. The electric current from the generator is divided at *j*, and passes through two independent circuits, 1 and 2. The circuit, 2, includes the two parallel flat coils, f^2 and f^3, and is always closed; and the other circuit, 1, includes the solenoids, *m*, m^1, and the carbons, *a*, a^1, and is closed only when the carbons are in contact, or when the arc is produced between their ends. The whole of the current first passes through the two flat coils, f^2 and f^3, thus instantly releasing the brake wheel, *e*, and allowing the rod, *c*, and carbon, *a*, to fall until arrested by the carbon, a^1; the circuit, including the solenoids, *m*, m^1, and the carbons, *a*, a^1, is thereby closed, and the greater part of the current passes through it, as its resistance is much less than that of the circuit, 2. The solenoid, m^1, is now attracted within the solenoid, *m*, against the action of the spring, *n*, drawing the carbon, a^1, with it from the carbon, *a*, and forms the electric arc between the ends of the carbons. The upper carbon, *a*, is now held up by the brake devices, *e*, e^1, as the spring, *h*, is adjusted to oppose the mutual attraction of the flat coils, f^2, and f^3, due to the amount of the current now passing through them.

2943. "Electro-magnetic motors." Sydney Pitt. (A communication from abroad by Moses Gerrish Farmer, of America.) Dated July 5. 6d. Relates to certain improvements in electro magnetic motors, in which the ends of an electro-magnetic coil or helix are united just before the connection between the helix and the electrical generator is broken, whereby the spark due to the discharge of the extra or induced current from the coil is prevented.

City Notes.

Old Broad Street, November 3rd, 1881.

The West India and Panama Telegraph Company, Limited.—The ninth ordinary general meeting of the members of this company was held to-day at the Cannon-street Hotel. The report of the directors, sets forth the accounts for the six months ending 30th June, 1881. The amount to credit of revenue is £41,303 4s. 1d., which includes £1,535 16s., interest received from underwriters in respect of insurance on the s.s. *Investigator*. The expenses have amounted to £29,366 12s. 8d., leaving £11,936 11s. 5d., which, with the balance of 1,956 5s. 9d. from last half-year's account, makes a total of £13,892 17s. 2d., out of which it is proposed to make a payment of 3s. per share on account of arrears of dividend on the first preference shares, amounting to £5,184 9s., and to carry the balance to current half-year's account. The traffic receipts for the half-year are practically the same as those for the corresponding period, the revenue of both periods having been affected by interruptions. All the stations of the company are now telegraphically connected, and the only cables interrupted are the original Jamaica-Santiago and Jamaica-San Juan sections, which are duplicated. These cables are in course of repair. The directors, from the experience they have gradually obtained, have had in contemplation the deviation of those sections of cable which have frequently failed over the same ground. Most of the necessary soundings to ascertain if safer routes could be selected have been completed by H.M.S. *Fantome*, and the company's s.s. *Duchess of Marlborough*. One of the most important of the deviations proposed, viz., that of the St. Thomas-St.-Kitts cable, was carried out by the company's s.s. *Grappler* in September last, with an expenditure of about 65 knots of cable. The whole of the detailed reports of soundings have not yet been received, but there is reason to hope that safer routes can in some cases be found, and that the effect of the deviations will be to reduce the chances of interruption. Three hundred knots of cable have been ordered, which will be ready for despatch to the West Indies in January next. The 7 per cent. debentures of the company, amounting to £10,200, became due on 1st May last. £4,400 of these were renewed at 6 per cent., the remainder have been retired, and £26,600 debentures have been issued on the terms stated in the circular of 25th June last, making the total issue of debentures to date £35,000 at 6 per cent. per annum. The directors proposed that Mr. Grosvenor should visit the West Indies again this autumn to continue the negotiations for increase of subsidies, and to endeavour to secure unanimity in the decisions of the Governments; but the prevalence of yellow fever in many of the colonies, and the quarantine regulations arising therefrom, interposed obstacles to travelling from island to island and necessitated the postponement of Mr. Grosvenor's visit. The negotiations have, however, been continued by letter, and it is understood that the Secretary of State for the colonies has communicated with the several Governments, recommending a conference of delegates to consider the telegraph question. Application for a subsidy has also been made to the Government of France, and is under the consideration of the Ministry. Mr. C. W. Earle, the chairman, said that, compared with the gloomy period 18 months ago, their position had improved, for they were able to pay their preference shareholders a dividend. There was, he was glad to say, no interruption in communications; but he was sorry to say, on the other hand, that some of the colonies had refused subsidies. With respect to France, it was proposed to lay before the Assembly a proposition to pay the company a subsidy of £4,000 a year. There was no doubt that the colonies were anxious for direct lines to this country. The ships of the company had been well employed, and had only been in harbour for the time necessary for repairs. The first duty was to maintain the lines, and if that was done public feeling in the West Indies would improve in their favour. Since the issue of the report the directors had placed the remaining £50,000 to debentures. He moved the adoption of the report. A discussion followed at the close of which the report was adopted.

Brazilian Submarine Telegraph Company, Limited.—The sixteenth half-yearly ordinary meeting of the shareholders in the above company was held October 28th at the City Terminus Hotel, under the presidency of Viscount Monck (the chairman of the company). The report of the directors for the half year showed that the revenue amounted to £86,017, the working expenses to £12,710, leaving a balance of £73,307, to which was added £34,310, the undivided profits to 31st December last, making a total of £107,617. After deducting income tax £1,107, there remained a balance of £106,510. A third interim dividend, amounting to £19,500, had been distributed, leaving the sum of £87,000, for appropriation. The directors now declared a final dividend of 3s. per share, making a total of 6 per cent. for the year, and the payment of a bonus of 2s., which together would amount to £32,500, being a distribution in the aggregate of 7 per cent. for the year, leaving a balance of £54,510, of which £50,000 had been added to the reserve fund, increasing that fund to £345,349, leaving £4,510 to be carried forward. The chairman, in moving the adoption of the report and statement of accounts, said he would trouble the shareholders with but very few remarks on the present occasion, for the simple reason that he had a very short story to tell. Referring to the table at the bottom of the report showing the receipts every year since the cable commenced operations, he thought the facts there disclosed were, to say the least, not unsatisfactory—(hear, hear). Beginning with the receipts of the year 1874-5 of £128,000, they kept creeping gradually up every year until they amounted to £167,000 in the present year. He did not think that could be otherwise than satisfactory to the shareholders. It showed the sound and gradual increase in the receipts of the cable, and that was combined with a gradual increase in what they had often had some discussion about in that room, viz., the reserve fund, which now stood at the present price of the investments in their ledger. That, of course, included the £50,000 which it was proposed to put in the reserve fund for the past year. There was another subject in connection with the receipts which was also satisfactory, and that was that the gradual increase in the receipts and reserve fund had been accompanied by a gradual contemporaneous increase in the net receipts of the shareholders. Last year they paid a dividend of 6 per cent.; this year they declared 7 per cent. As soon as the board were satisfied that they could give them—not 7 but 20 per cent.—consistently with the maintenance of their concern, they would give them every shilling they earned, but they considered it was absolutely necessary to lay up in order to secure the permanence of their dividend. Turning to the other side of the account, he said the expenditure for the past half-year, as compared with the previous half-year, showed an increase of £967. That increase was exclusively confined to the stations out of London. The general expenses in London showed a decrease of £59. The increase in the out stations was brought about by certain special payments, which must recur after certain periods of time, but which did not recur every year. That was due to the fact that they had spent £454 for new furniture, and they had paid a sum of money to the Brazilian Government for the importation of those articles into the Brazils. There had also been a new Government tax imposed at Pernambuco and Lisbon, which accounted for about £120 more. Turning from the accounts, he paid a brief tribute of respect to the memory of his late colleague, Mr. W. H. Clark. There was one other point, standing there as he did as the representative of their managing body, upon which he ought to touch. He alluded to the fact that a diminution of the insulation had taken place in one of the three sections in which their cable was divided, as follows:—From Lisbon to Madeira, from Madeira to St. Vincent and Cape de Verde, and from St. Vincent to Pernambuco. The cable, however, was working perfectly well; it was carrying all the messages they wanted, but there was undoubtedly this depreciation in the insulation. Experiments had been made, tests had been applied, with the result that the flaw had been localised and calculated to exist somewhere about 30 miles from Pernambuco, in water of not more than 14 or 15 fathoms. The repair of the cable was as certain as if it were lying on the floor of that room, but it was a mere question of time and expense. They had sent out directions to work the cable as long as it would hold, and in the meantime they were doing there business and taking their receipts just as they did before. Having assured them that there was not the least cause for alarm, he concluded by moving the adoption of the report, which was seconded by Sir James Anderson (vice-chairman), and upon being put to the meeting was declared unanimously carried. The dividend was then declared, and Sir Thomas Fairbairn, bart., having been duly elected a director of the company, a shareholder rose and put several questions. The chairman, in reply, having reminded the hon. proprietor that his remarks were out of order, said with regard to the three sections it was quite plain that any one of these sections might give out, but the other two would remain in full working order. He declined to answer the next question, which had reference to the reserve fund. They had the exclusive right of carrying messages to the Brazils for nearly twelve years more. The usual compliment to the chairman, directors and officers of the company brought the meeting to a close.

EDISON GOWER BELL TELEPHONE COMPANY OF EUROPE.—We are informed that a new company (with a capital of £500,000) for working the telephone in most of the principal countries of Europe has been registered under the above title, with Colonel Gouraud as chairman.

INDO-EUROPEAN TELEGRAPH COMPANY.—Direct communication with India by the Indo-European line is at present interrupted from this country owing to the breakage of the submarine cable between England and Germany. The line is, however, working as usual in connection with the Continent of Europe.

The following are the final quotations of stocks and shares for Nov. 3rd.:—Anglo-American, Limited, 52½-53; Ditto, Preferred, 81½-82½; Ditto, Deferred, 23½-24; Brazilian Submarine, Limited, 11⅛-11⅜; Brush Light, £4 paid, 7¾-8¼; Ditto, £10 paid, 16-17; Electric Light, 1-1¼; Consolidated Telephone Construction, ⅞-1⅛; Cuba, Limited, 9½-10; Cuba, Limited, 10 per cent. Preference, 16-17; Direct Spanish Limited, 5-5½; Direct Spanish, 10 per cent. Preference, 14½-15½; Direct United States Cable, Limited, 1877, 10¾-11; Debentures, 1884, 100-103; Eastern Limited, 10-10¼; Eastern 6 per cent. Preference, 13-13¼; Eastern, 6 per cent. Debentures, repayable October, 1883, 100-103; Eastern 5 per cent. Debentures, repayable August, 1887, 100-103; Eastern, 5 per cent., repayable Aug., 1899, 105-108; Eastern Extension, Australasian and China, Limited, 11-11¼; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 108-111; 5 per cent. Australian Gov. Subsidy Deb. Scrip, 1900, 102-105; Ditto, registered, repayable 1900, 102-105; Ditto, 5 per cent. Debenture, 1890, 99-102; Eastern and South African, Limited, 5 per cent. Mortgage Debentures, redeemable 1900, 102-105; Ditto, ditto, to bearer, 102-105; German Union Telegraph and Trust, 10¼-10¾; Globe Telegraph and Trust, Limited, 6⅜-6⅝; Globe, 6 per cent. Preference, 12½-12¾; Great Northern, 11¾-12¼; 5 per cent. Debentures, 103-106; India Rubber Company, 24-25; Ditto, 6 per cent. Debenture, 104-105; Indo-European, Limited, 27½-28½; London Platino-Brazilian, Limited, 4½-5; Mediterranean Extension, Limited, 2½-3; Mediterranean Extension, 8 per cent. Preference, 9½-10; Oriental Telephone, ¼-½; Reuter's Limited, 12-12½; Submarine, 290-300; Submarine Scrip, 2⅝-2⅞; Submarine Cables Trust, 97-100; United Telephone, ——; West Coast of America, Limited, 4¼-4¾; West India and Panama, Limited, 1¾-2; Ditto, 6 per cent. First Preference, 7½-8; Ditto, ditto, Second Preference, 6¼-6¾; Western and Brazilian, Limited, 6¾-7¼; Ditto, 6 per cent. Debentures "A," 110-115; Ditto, ditto, ditto, "B," 98-102; Western Union of U. S. 7 per cent., 1 Mortgage (Building) Bonds, 123-128; Ditto, 6 per cent. Sterling Bonds, 104-107; Telegraph Construction and Maintenance, Limited, 26½-27½; Ditto, 6 per cent. Bonds, 104-108; Ditto, Second Bonus Trust Certificates, 1⅝-1⅞.

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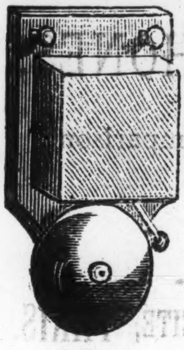
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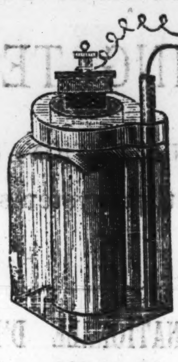
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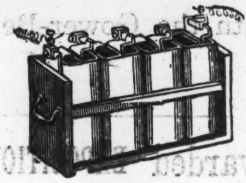
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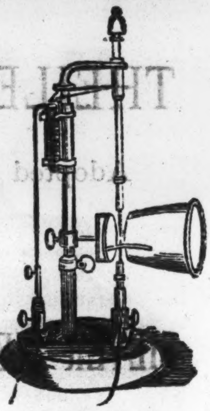
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FIG. 1.

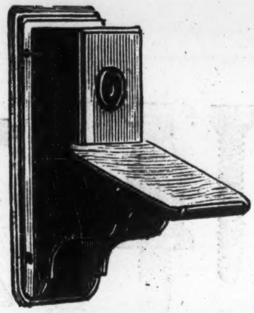


FIG. 2.

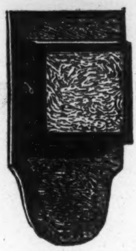


FIG. 3.

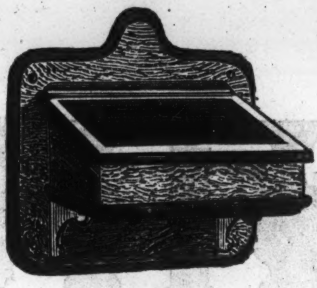


FIG. 4.

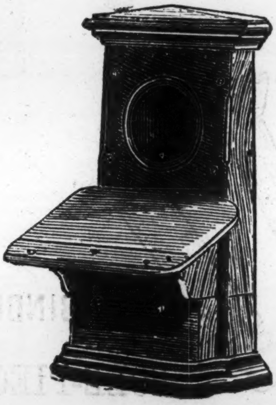


FIG. 5

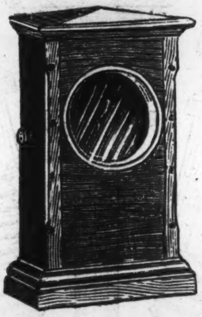
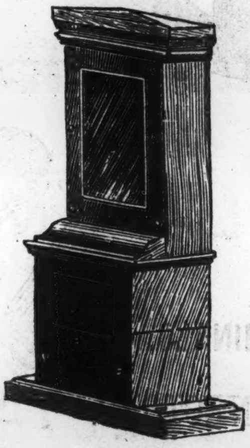


FIG. 6.



This exhibit, which is the only one of the kind in the whole Exhibition, is by that enterprising cabinet-work manufacturer, Mr. W. M. Foxcroft, of 54, Compton Street, Clerkenwell, London, E.C. It consists of a large number of wooden cases for telegraph apparatus of every description. These cases are very fine specimens of work as regards design and finish, and reflect great credit on the manufacturer. Fig. 1 is a new design for a "Blake's" transmitter and bell case combined; hitherto this has necessitated two separate cases, one for the bell and one for the transmitter, but in Mr. Foxcroft's case the two are combined, the transmitter being in the upper portion, and the work for the bell being under the desk; the bell is placed under the latter with the push just above. Fig. 2 is simply a sample of a bell case for domestic purposes, as shown by Mr. Foxcroft in various woods. Fig. 3 shows a specimen of the well-known "Gower-Bell" telephone case. These cases are shown in woods to match the fittings of any mansion or house of business; those of teak are adopted by Her Majesty's Government. For business purposes, and for mansions, we have satinwood and black, onyx and black, black and gold, brown, oak, walnut and other fancy woods suitable for the most artistically fitted mansions. Fig. 4 represents a sample of the speaking instrument case (single needle) in use upon the Midland Railway. It is similar to the General Post-office pattern. Fig. 5 is a view of a case for "Syke's" block instrument (*see* "Telegraphic Journal," June 15th, 1880). The wear and tear upon the case being great the simplicity of the design has been necessitated by the strength required. Fig. 6 shows the ordinary block instrument case (single needle) so extensively used by the various railways throughout the world.—"*Telegraphic Journal,*" *October 15th, 1881.*

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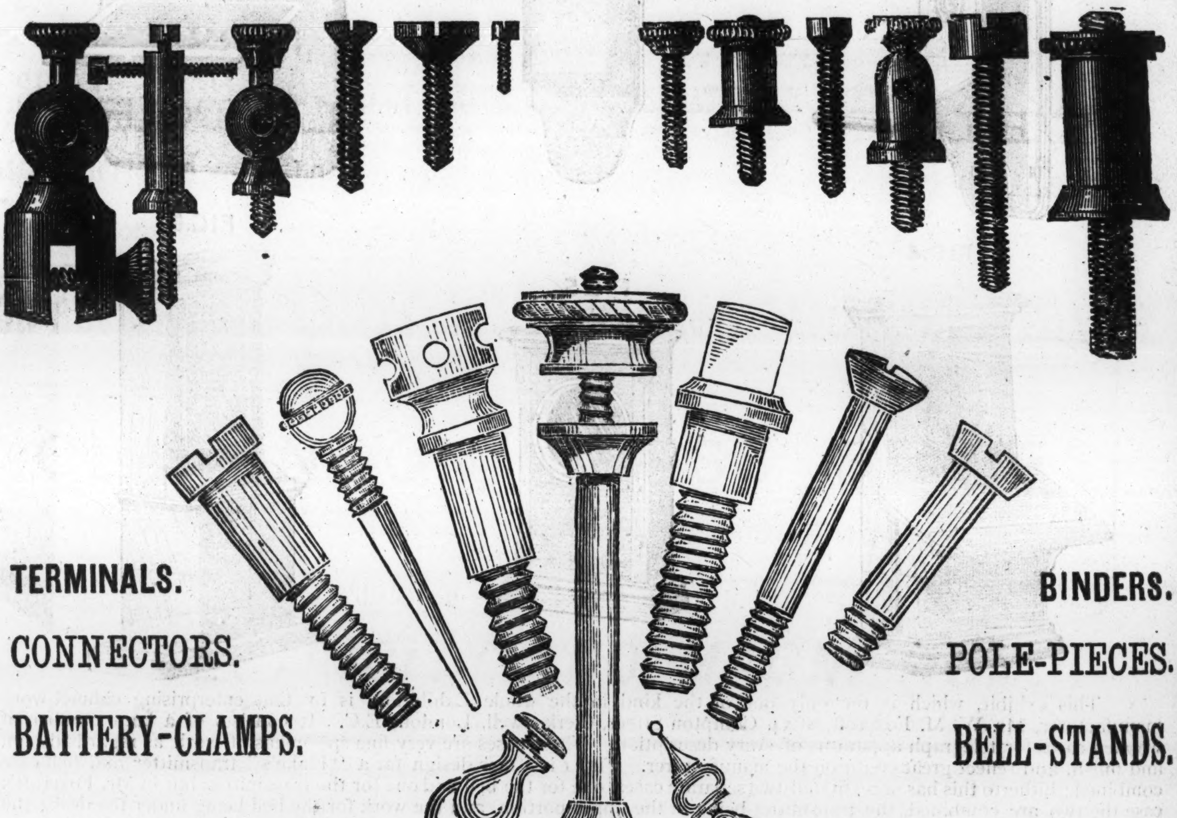

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